# JOURNAL OF GAS LIGHTING, WATER SUPPLY, &c.

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## EDITORIAL NOTES—GAS, &c.

### An Appeal.

IT is with considerable pleasure that we accord prominence to an appeal that Sir George Livesey makes in another column [p. 681] to the gas industry, to annually provide the stipend for the recently founded Professorship of Fuel, Solid and Gaseous, at the Leeds University. The new department commences its work on the 1st prox.; and it will give the greatest possible pleasure to those who have interested themselves in this scheme if, well before that date, the amount of the stipend is permanently assured. The sum required is the modest one of £500 a year. In its provision, the sympathy of the Gaslight and Coke Company, and therefore of the Governor, Mr. Corbet Woodall, has been enlisted; as well as of the Leeds Corporation Gas Committee, the South Metropolitan Gas Company, and (there is little doubt we shall soon be able to add) of the South Suburban Gas Company. Out of this new departure of the Leeds University (which was fully explained on July 16 last, pp. 147, 152), the gas industry—and not unnaturally—will desire to obtain as much prospective benefit as possible through the higher and more comprehensive training of its technical officials. To realize this, the department must be attached to the gas industry and the gas industry to the department with more substantial bonds than the provision the Institution of Gas Engineers has made (valuable as that provision is) for special research work. Sir George suggests the way; and through our columns he makes his appeal, seeing that personal application for money is objectionable to him, as it is not infrequently to the recipients of such personal applications. But we are at liberty to put it to those who would have made ready response to a personal appeal from Sir George to accept his present general appeal as having been individually made to them, and not to delay in responding.

The cause is a good one; it is the provision of a better opportunity for the complete training of the men required in the gas industry than has hitherto been afforded. The invitation to gas undertakings to promise an annual subscription towards this particularly good industrial cause is issued to all gas undertakings. The Leeds Gas Committee have already headed the list with £100; and the same sum is promised annually by the Gaslight and Coke Company and by the South Metropolitan Company. The South Suburban Gas Company, there is reason to think, will be good for £20. Anyway we have here £300 towards the £500 required; so that only £200 a year more has to be raised. But on this point we will presently make a suggestion. Sir George trusts that the Gas Committees of the other Yorkshire towns will follow the example of the Leeds Corporation, and that Gas Companies generally will follow that of the two London Gas Companies. There is no reason why contribution from local authorities should be limited to the Yorkshire gas-works owning towns; the intellectual product of the new department will be available to the whole British gas industry. Respecting the before-mentioned point as to surplus offerings. Sir George proposes that "if a larger sum is "offered than is necessary, the individual subscriptions "shall be reduced proportionately to the business of the "contributors." The offering of subscriptions will show a sympathy and a willingness to contribute; and therefore it may be suggested that, if there is a surplus, it should be allowed to accumulate until—who knows?—a fund may be established, subject to safeguarding conditions, and possibly administered by the Institution of Gas Engineers—which would assure the stipend, and render the gas industry independent of further contribution.

It is not often that Sir George Livesey has personally asked anything of the gas industry. He is doing so now; but it is a small thing that he desires. We hope the list of subscriptions, which we shall be happy to publish in the "JOURNAL," will show that his appeal has not been made in vain.

### At the Welsh Meeting.

COMMERCE, manufacture, and the new instruments of offence and defence of the electrical opponent were subjects of prominence at the meeting of the members of the Welsh Association at Shrewsbury on Wednesday last. Mr. E. Jones, of Burslem, is the new President; and his title to the position is that he was one of the founders of the organization, and was until quite recently the Engineer and Manager of the Pontypridd Gas-Works. It was in his Inaugural Address that in many ways commerce and manufacture were dealt with; and it was in a paper by Mr. J. H. Canning that the new lamps of the electrical industry were treated upon. Regarding first the address. If anything, it was somewhat too long; but we must do the President the justice of saying that, extensive as it was, he contrived to put interest into every one of its manifold features. He is an advocate of Commercial Sections in connection with technical gas organizations, with this proviso that they must do nothing to prejudice the technical work of the organizations. We are with him completely in this matter, and really must plead a want of understanding of the antagonism of the few to associated movement and work in connection with the commercial side of gas undertakings. Take the revenue account of a gas undertaking. Look at the items carefully one by one; and then attempt to answer the question, Why should not the commercial work, as well as the technical, be the subject of associated endeavour? The dividing-line between the commercial and technical parts of an undertaking is narrow; and, perhaps unintentionally, the President gives point to this in referring to the cost of coal and then passing direct to the question of carbonization.

There are indications all round that the price of coal will be permanently higher in future than the prices that have ruled of late years; and, this being so, thanks are due to those who have borne the brunt of the battle in making easier the paths of the responsible officials of gas undertakings by breaking down the statutory and unreasonable requirements of high illuminating power and purity, which breaking down has furthermore given a scope to the technical work of carbonization not previously enjoyed by the gas engineer. Whence are we drifting in carbonization? Most men are reserving judgment on this momentous question. The President says: "I have always supported high heats and long "duration charges; and my experience convinces me that, "if we are to cheapen our gas, we shall have to resort more "towards coke-oven principles." There has not been sufficient evidence advanced yet to show that the President's conviction rests on any very sure foundation; and it would have been of interest had he expanded a little more on this, and enunciated the reasons for the conviction. The future of carbonization may be, as he somewhat guardedly expresses himself, "towards" coke-oven principles; but the testimony up to the present leads to the belief that for the gas maker the stop will have to be made long before the existing coke-oven practice is reached. But while we are looking for more imposing things in connection with carbonization, great progress has already been made; and the fruit of the progress is marked in the Burslem carbonizing accounts, which show that whereas with regenerative horizontal settings the cost of carbonization per ton of coal is 3s. 1·5d., with inclined retorts and their auxiliary plant the cost is 1s. 10·1d. per ton. This is satisfactory; but, as already said, there is something to be grateful for in that the Legislature has, through the abatement of requirement, given to gas practitioners even greater scope for effecting progress. Truly, says the President: "Never was our industry in greater need of the dis-"tribution of a low-cost gas than in the present, and no "manager can afford to neglect details, however small his "works."

The President spoke approvingly of retort-house governors, of the Fiddes-Aldridge discharger-charger, as also of the Hastings carburation process for relief from naphthalene troubles; while purification occupied quite a large space in his address. In view of the editorial article in last week's issue on the field for business that heating presents to the gas industry, it is interesting to read the President's remarks

on the subject, and of what he is doing in the way of the hire-purchase of fires. But the address is full of experiences on these and such questions as the competition with electricity, high-pressure distribution, and the waste gases and effluent of sulphate plants. To treat of all these matters here would be to traverse the whole address. The President surveys the gas industry's affairs with evident satisfaction; and it is plain that with him obstacles only arise to be negotiated and conquered. That is as things should be with a manager in the progressive gas industry.

In all businesses, no matter their character, it is the best the competitor can do upon which one's eyes has to be kept. The domestic lighting business in both the gas and the electricity industries is the largest branch; and not by any means insignificant ones are shop and street lighting. For domestic, shop, and side-street lighting, the new metallic filament lamps constitute the best in efficiency, given suitable conditions, that purveyors of electricity can offer; while for main street lighting and the illumination of exteriors of large premises, flame arc lamps are best in the same respect, though not in others. This being so, gas engineers should keep an eye on these particular lamps, which, while they have the one merit in illumination efficiency for the current expended, lack (may we not say ?) all the other merits of the older forms of carbon filament lamps and arc lights. The paper by Mr. Canning gives us a compendious account of these lamps; and what he has to say upon their weak sides is not one whit exaggerated or misrepresented, but, if anything, understated. It is in the compendiousness of the paper that its value is found; for the greater part of what he says about the lamps is, and perhaps in more detail, scattered through our "Electric Lighting Memoranda" the past year or two. Comment has been frequent; and therefore there is not much that is fresh that can be said by us on the paper. It must not, however, be understood by this that Mr. Canning does not present any new points to supplement the value already attributed to the paper. There are several which he has collected by observation and investigation. One of interest and importance is his research into the spectrum of the flame arc light, the result of which research is that he finds the spectrum is not in any sense a continuous one. This is a scientific fact worth knowing as bearing upon the performance of the flame arcs. The performance of these lamps can be regarded, as has been shown oftentimes in the "Journal" and now by Mr. Canning, from many points; and the attention that has been so bestowed upon them has checked the impetuosity with which tradesmen who favour cheap-jack methods of advertising at first ran after the lamps. Claims have been unsubstantiated by time and experience; and whether for street or external shop lighting, their imagined virtues have been largely discounted.

What is true of flame arc lamps is also true of metallic filament lamps. Mr. Canning tells us of their reputed efficiencies, and of their proved defects and unsuitability, from the consumers' point of view. An effective life is ascribed by electricians to these lamps ranging from 600 hours up to a figure that is sufficient to make one stand amazed, until it is recalled to mind that the figure is the result of a test carried out under the comfortable conditions of the laboratory. Mr. Canning has ascertained that the actual life of a "Tantalum" lamp in a shop window where it is exposed to the vibration of traffic is, on an average, 216 hours; while of two "Osram" lamps fixed in series in a similar position, one failed after less than five hours' use. From Chelmsford we learn that during the past year 307 Nernst lamps were installed in the town; the replacements numbered 1978—the life per burner being 572 hours. Considering these figures, and the initial cost of the Nernst and the metallic filament lamps, the expense of renewals must be something enormous. Among the inherent defects of the metallic filaments are their unsuitability for high voltages; but there is persistent work going forward to overcome this. When success has appeared to be within grasp in this respect, a lamentable escape of efficiency has accompanied. There is one point concerning Mr. Canning's comparison as to the running cost of Osram lamps and incandescent gas-burners which indicates his desire to keep on the right side. The Osram lamps are referred to as being of 32-candle power. This should be 32 Hefner units. The lamps therefore at their best are only of between 28 and 29 candle power; and the difference on the two lamps is consequently about 6 candles. The cumulative effect of such a difference is not to be despised or disregarded. On the other hand, Mr. Canning takes credit for only 64-candle power for a consumption of 4 cubic feet in an incandescent gas-burner. Of course, the character of the burner and of the gas has to be taken into account; but 72 to 80 candles is not an uncommon result with a good burner, consuming 4 cubic feet of gas an hour. The cheapness of incandescent gas lighting leaves a large margin; but the cumulative effect of the difference pointed out is a valuable one. Like Mr. Canning, our admiration is great for the industry and the scientific skill that have been brought to bear upon the needs of the electrical industry. Like him, too, we are of opinion that the issue of the contest between the incandescent gas-lamp and the metallic filament lamps can well be left in the hands of the public.

## Labour Congress—Old-Age Pensions.

The delegates of Trade Unionism have been in conference at Bath. There has been the usual outpouring of verbosity, and a repetition of all the old extravagances that have become indurated by time, but not accomplishments. Still Trade Unionism is cock-a-hoop. The present Government, have been kindly disposed, and have given to labour the Trades Disputes Act (which allows "peaceful" picketing, the true interpretation of which phrase has been given by Belfast), and the new Compensation Act. Much of what has been recently done in Parliament for labour is described by the President of the Congress (Mr. Gill, M.P.) as "con-"structive" legislation; but in regard to the larger portion of this particular legislation, we should prefer to replace the prefix "con" of the adjective by that of "de." However, the Trades Unionists cannot rest content for even a space; and, like the immortal Oliver, they want more. But, unlike Oliver, their wants are not limited by a basin of small capacity. As the leaders of Trade Unionism drift more and more to the broad stream of Socialism (some have already developed to Socialistic extremists), so their schemes become the more unpractical. Thus we have this annual conference of the delegates of Trades Unions made the debating-ground for all sorts of impossible projects, instead of for matters of real practical worth to the country's workers. These leaders and demagogues naturally become more hopeful of the realization of their dreams with their growth of power. Several members of Parliament, and many town and county councillors, are now of their own class and factions; and thoughts of swollen heads are uppermost as we read the reports of the pratings of the wealth of the political power of organized labour. We do not sneer at that power. Its greatness is beyond dispute; but we would that it were turned to really good purpose. Great, however, as the power admittedly is, it is insufficient to break down the social fabric, and give labour, by any short method or route, any substantial realization of the visions of those who lead. They assert an intention to have all they want; and even the House of Lords is not to be allowed to stand in their way. The House of Lords has given offence to the Socialists. The legislation to which that House has been a party in the interests of labour is, ungratefully, affirmed to have been due to fear rather than to any feeling of equity; but the rejection by the Lords of measures passed by the Commons is regarded as an unpardonable indignity on the "representatives" of the people. Therefore the delegates of associated labour are for the removal of the Lords.

The report to the Congress of the Parliamentary Committee contained a long list of wants, which the delegates are minded that labour shall get, whether the intelligent section of the workers of the country think well of them or not. There is the Miners' Eight-Hour Bill, which, if it becomes law, will permanently raise the price of fuel and other commodities to the workers of the country. That measure has to be passed, it seems, in the cause of the unemployed; and the employed, the steady, the thrifty are to be penalized in consequence. The same problem of unemployment is to be dealt with by a general legal restriction of the hours of labour—overtime is to be abolished wherever possible, and a universal eight-hour day applied. The President urged the abolition of overtime, as he is sensibly convinced that there is but little to be gained by kicking against growing application of machinery. Trade Unionists pay little attention to the fact that their excesses are largely responsible for the stimulation of the adoption of machinery in the industries. Mr. Gill is careful to ascribe the extension of mechanical operations to the necessity for economy and to the "inevitable." That is not the end of the causes producing certain effects; and, as we say, there is a further

and a powerful cause to be found nearer home. The Parliamentary Committee also placed the legal restriction of overtime in their recommended programme. But what must the President and the Parliamentary Committee think of the delegates who (agreeing with them in this matter) declined to pass a resolution pledging those present to do all in their power to discourage employment on Sundays? The sanctity of the Sabbath cannot by these Socialistic leaders and Trade Union roisterers occupy the same high-level ground upon which they place the sanctity of the interests of labour. If shortening the hours of work is to palliate unemployment, there should be completeness of action. Lessened hours, however, will not solve the problem of the unemployed. Nothing so simple will materially effect it. In no small degree, the solution of the problem is to be found among the unemployed themselves. Intellectual poverty and incompetence are largely the causes for unemployment in these times of brisk trade; and the adoption of the principles of Trade Unionism by so many men has fostered these deficiencies and produced degeneration. And there has been drummed into willing ears that the interests of labour demand that as little work as possible shall be done for a given rate of pay. Slackness of men, a mean grade of ability and of conscientiousness, and distrust, are the fruits; and these things can only be eradicated by those who have sown and nurtured them, and competent workmen be raised from the ranks of the unemployed, three parts of whom are at present unskilled, and only qualified for what can really be regarded as only shifting and temporary labour.

The question of old-age pensions is to be the chief plank in the platform of labour in the coming months; and pressure is to be brought upon the Government to deal with the matter next session. The anticipated surplus of the Chancellor of the Exchequer in the current financial year—which he has, before it is obtained, ear-marked to form a nucleus for old-age pensions—is not regarded as a sufficient guarantee for an early and adequate treatment of the subject. The Socialists desire that the subject shall forthwith be dealt with on a broad national basis. They want whatever scheme is materialized to be universal, non-contributory, and non-discriminative. The President and members of the congress put down the pension at not less than 5s. a week, and the age of sixty as that at which it could be demanded; and the Chancellor of the Exchequer is to be requested to make adequate provision in his next Budget for a commencement of pensions on these lines. The Prime Minister and the Chancellor of the Exchequer have both bound themselves to discountenance any scheme that is not universal, non-contributive, and non-discriminating; and, so far, they are in accord with the Socialists and Trade Unionists. In this, we are certain that both the Premier and Mr. Asquith are wrong. It would be grossly unjust for any nationally provided pension to be the right of the prodigal and the profligate. Therefore it is with some amount of favour that we look—writing subject to fuller consideration and discussion—upon the scheme suggested by Lord Avebury and others, as published in "The Times" last Tuesday. Into the details of the scheme we need not now enter; but it is founded on a contribution from friendly societies, other bodies, or individuals; and upon the fund so accumulated the Government it is proposed shall pay interest—the age of the beneficiaries being put at 65 years. The scheme is submitted as a reasonable, economical, and practical one; but we fear that the Government have committed themselves too far to entertain a project bearing any such characteristics. The scheme of Lord Avebury and his associates is based on the principle of the nation, through the Government, helping those who are willing to help themselves; and it provides the most effective test of whether or not a man desires a pension, in his willingness to pay something for it. The Trade Unionists call this trifling with the subject. The flaw we see in the scheme is the absence of provision for those who are in a position to prove that affliction or unpreventable penury are the obstacles, and not the want of willingness, to passing the test. Loth indeed should we be to see such men—the most deserving—barred from a pension in old age through uncontrollable circumstances. But no scheme will be free from blemish that does not compel the generality of workers to contribute something for what they are to receive, and certainly a pension that asks nothing of the beneficiaries will work irremediable harm upon thrift. This lesson is one that has been learnt in following up the successes of profit-sharing and co-partnership.

## Effect of Low Prices at Sheffield.

The Chairman of the Sheffield United Gas Company (Mr. Wilson Mappin) was fully justified, at the half-yearly meeting of shareholders last Tuesday, in characterizing as "extremely satisfactory" the increase of 9·33 per cent. in the sale of gas in the six months ending the 30th of June, especially as it followed a rise to the extent of 7·21 per cent. in the corresponding period of last year. This growth in the Company's business affords striking evidence of the appreciation by the inhabitants of the district served by the Company of the efforts of the Directors to furnish them with a supply of gas at a figure which makes Sheffield conspicuous among the towns in which this business is in the hands of private companies. As the result of the liberal and progressive policy adopted by the Board, a gas consumer is now able to obtain for a penny a light of from 50 to 60 candles for 16 hours; and when this is compared with an ordinary electric lamp, which gives a light of only from 12 to 16 candles for four hours for a similar amount, the Chairman was quite safe in saying that gas has nothing to fear from the competition of electricity in the borough. There is just one element likely to disturb the happy condition of the gas consumer; that is the increasing price of coal. There is, however, a good balance—close upon £100,000—on which the Directors rely to enable them to maintain the present price for the next twelve months. As to what may be the ruling coal prices then, it would, of course, be folly to speculate. Mr. Mappin is of opinion, judging from past experience, that the existing "boom" will not last more than a year or two. Meanwhile, he is hopeful that the present condition of things will cause the public to reflect as to whether the Government are acting wisely in allowing such large quantities of all descriptions of coal to be exported free of duty, the re-imposition of which would, as he suggests, have provided the Chancellor of the Exchequer with the nucleus of a fund for old-age pensions. But Mr. Asquith expressed in the House of Commons, towards the close of the session, his determination not to re-impose a coal duty of 1s. per ton or any other amount; and his statement was received with cheers. Whether before the meeting of Parliament next year there will be such an expression of public opinion in this matter as to cause him to change his views, remains to be seen. Meanwhile, so far as Sheffield is concerned, there will be cheap gas available for all who require it for the production of light, heat, or power.

## "Reserved for the Directors' Friends."

Limited in everything but its title and appetite for money is the Robertsbridge, Salehurst, and Hurst Green Water and Gas Company. We recognize in this concern one of a group of which investors are strongly advised to steer clear. A prospectus has been circulated announcing a fresh issue of 750 6 per cent. preference shares of £5 each in the Company and 200 ordinary shares of £5 each, unrestricted as to dividend. "Unrestricted as to dividend!" That is a new allurement; but we venture to say, with confidence, that there will be a large amount of restriction as to dividend from an undertaking with a large capital for the available business—merely supplying on sufferance in the rural districts of Robertsbridge, Salehurst, and Hurst Green. The prospectus is printed in red and black ink, and in large and small type. The shares are to be issued at par—"par" being printed in capital letters, for the purpose (we suppose) of preventing foolish investors making themselves more foolish by offering a premium. It is seen that the water is supplied in bulk by the Ticehurst and District Water and Gas Company (another member of the same family of virtuous ventures); and the "right"—who gave the "right"?—"to distribute such water and supply gas within a defined area is now vested in the Robertsbridge, &c., Company." The prospectus is full of cunning and non-committal statement—all designed to attract the unwary. Hearken to this: The Company "has a promising future, being situate in a part of Sussex where coal is *reported* to be found on Earl De la Warr's estate." Why "reported"? Has coal been found there, or has it not? The Directors of the Robertsbridge Water and Gas Company surely ought to know. Then, again, the water-rental book of the Company shows that "for the half year ending March 25 last, there was a 40 per cent. increase in water-rental and a 47 per cent. increase in new consumers." Why are the exact figures not given? Are their dimensions too poor to stand the light of publicity? There can be a 40 per cent. increase on a £5 note, and a 47 per

cent. increase on a number of consumers containing only double figures or even a single figure. Then, further, the Directors are "negotiating for the supply to several large residences in the district." But negotiation is not possession. So we go on with indefinite statement, till we come to the form of application, at the top of which we read the words printed in all the glory of red ink: "For allotment out of the shares reserved for the Directors and their friends." Now the particular copy of the prospectus before us was addressed to a lady, who, we believe it is right to say, disclaims all friendly connection with, or any desire for the friendship of, Dr. Allan Maclean, Alfred Schofield (a Director of the Water and Gas Debenture Trust), E. Eaton, C.E., "Consulting Gas and Water Engineer and Contractor, St. Leonards-on-Sea," and possibly of Cannon Street, E.C., or anyone else connected with the Company. The prospectus was accompanied by a letter printed in the style of type writing, and addressed to "Dear Madam." We protest strongly against the promoters of these concerns whose finances and prospects are not above suspicion, picking out lady gas and water shareholders on whom to practise their artifices, and also against the use of such decoying statements as: "Your application, if made on the enclosed form, will be entitled to *a small allotment* at par out of a few shares of this issue reserved for the Directors' friends." The Directors and John Harris, the Secretary, know full well that, within the terms of the issue, what applicants ask for they will receive; and their money will be handled with unfeigned pleasure.

## Seventy Years' Progress at Sydney.

The proceedings at the annual meeting of the Australian Gaslight Company, which are reported in another part of the "JOURNAL," are of more than usual interest from the fact that the Chairman (Mr. G. J. Cohen) was able to give the shareholders some particulars, supplied to him by an eye-witness, of the improvements in the gas lighting of important public thoroughfares in London, Paris, and elsewhere, and thus to adduce evidence to colonials of the firm hold which this system of illumination still has on this side of the globe, notwithstanding the many attempts to displace it—or, as he put it, to "relegate it to the background." The example of London may well be held up to the municipal authorities of Sydney, if they contemplate, as it appears they do, lighting certain of the public parks. They will find high-pressure gas equal to all their requirements, and doubtless far less costly than electricity. But the feature of special interest in Mr. Cohen's address was his short sketch of the Company's progress in the seventy years of its existence. At first, the gas was supplied at a certain price per light; but when the supply by meter was introduced, the charge was 25s. per 1000 cubic feet, and the public lamps cost £10 per annum; whereas the figures are now 4s. and £4 respectively. The Company have upwards of 77,000 consumers, 2465 of whom came upon the books in the six months ending the 30th of June; and there are 25,000 houses fitted with prepayment meters. In proof of the appreciation by the inhabitants of Sydney of gas as a culinary agent, Mr. Cohen mentioned that the Company had sold 15,176 cooking-stoves, of which 564 had been placed in the preceding half year. Truly, the growth of the undertaking has been remarkable; and both shareholders and consumers have participated in its success.

## Four Shillings a Day.

For some time past a motion has been standing in the name of a member of the Liverpool City Council, to the effect that a former resolution of the Council that able-bodied men employed by them should receive wages of not less than 4s. per day, should be altered by the omission of the words "able-bodied men," and the substitution of "men able to do a full day's work;" and at a meeting a few days ago it was discussed—and rejected. It was explained that the reason for the proposition was that, according to an official report issued a year ago, there were over 600 men employed by the Corporation at less than 4s. a day; and though it was admitted that these men were old, and could not do the arduous work they formerly did, the argument was put forward that "they did equally good work the whole day long, and by acting as they did the Committees were taking a mean advantage of men who had spent the best years of their life in the service of the Corporation." Apparently, this was regarded as sentiment by the majority of members; and some forcible reasons for the rejection of the motion were adduced. In the first place, it was urged that a corporation had a duty to employees which private persons had not; and the hope was expressed that the Corporation would, as far as possible, employ old men who would not be engaged by other people. This, surely, is a sufficiently generous view to take of a public authority's responsibility, without further saddling them with an obligation to pay "able-bodied" wages for such labour. In fact, as was pointed out in the debate, it is only reasonable to suppose that, had the resolution been passed, the effect would have been to make it impossible for the Corporation to take on elderly men, who would thus have been in a worse position than they now are, inasmuch as they would be exchanging a wage of less than 4s. a day for none at all. Further food for reflection on the part of those favouring a hard-and-fast "minimum wage" was provided by another member, who pointed out that, as the rigid regulation of wages progressed, the number of people who were not able to attain to it increased; and they were at the mercy of the sweaters. The only employment that was open to a man below full power, he added, was through the Corporation; and this was being closed more and more by the fixing of a rigid rate of wage. In other words, the question for such men seems to be whether half a loaf is not better than no bread. According to what transpired in the course of the debate, the men themselves have little hesitation as to what the answer should be.

## The Question of Municipal Coal Supplies.

Equally—in fact, even more—unfortunate was another motion by the same member of the Liverpool City Council, that, in view of the large increase in the price of coal, it was desirable, both in the interests of the Corporation and of the general public, that steps should be taken towards breaking down the monopoly in the coal trade; and that the Town Clerk be instructed to take the necessary steps towards securing the co-operation of other municipalities in Lancashire, Cheshire, and Yorkshire with a view either to joint action in the purchase of coal mines or in pressing the Government in the direction of the nationalization of the coal mines. As only two voted in favour of the proposal, it may be assumed that (whatever the exigencies of the situation may force upon them in the future) the Corporation of Liverpool have no desire yet to carry their trading to the length indicated; while as to the alternative of pressing the Government to nationalize the mines, possibly the prevailing opinion was that the Government have already sufficient on their hands without the addition of such a scheme as this. The reason set forth for the motion was that the municipalities, as large consumers, were hard hit by the ring in the coal trade; and that it was time the Council, in co-operation with other authorities, should take some steps to break down the monopoly. On the other hand, it was argued that there could not be any monopoly in the coal trade when there were in Lancashire alone 115 collieries, in Yorkshire 172, and in Derbyshire 52; and that in Lancashire there could be no ring, because some of the largest colliery proprietors did not belong to the Association. This may be so; but, at any rate, there appears to be a good deal of unanimity in the manner in which prices are raised. As to price, it was stated that, during the past twenty-six years, there were only three occasions on which the Corporation could suggest that they had paid more than they ought to have done; and that if they had a colliery of their own, they would never be able to get slack so cheaply as they had been buying it. No doubt this is a pudding the proof of which would be in the eating; and this is a course which, as already mentioned, the Corporation are not inclined to adopt. To a final question put by one of the speakers no answer was vouchsafed—namely, what the Corporation would do with the coal that would be raised from the municipal colliery, seeing that they mainly used slack at the electricity works.

**Manchester and District Junior Gas Association.**—We learn from the Hon. Secretary of the Association (Mr. Alfred L. Holton) that the Council have felt the desirability of so altering the rules that the following points may be obtained: (*a*) Ample time for the new Council to prepare and publish a programme of the season's work; and (*b*) that only a portion of the Council should retire each year, in order that their work may have continuity. To secure these ends, the Council have prepared a set of revised rules, which will be submitted to the members at the annual general meeting to be held in Manchester on the 5th prox. Arrangements are being made for a joint meeting of the Junior Associations and a visit to the Manchester Gas Exhibition on the 2nd of November; and Dr. Harold G. Colman has promised to give a lecture on the 23rd.

## THE NEW DEPARTMENT AT LEEDS UNIVERSITY

### An Appeal from Sir George Livesey.

In the "JOURNAL" for July 16, the prospectus of the new department of the Leeds University, which is to be specially devoted to the study of solid and gaseous fuel, was published; and in the same issue we were pleased to be in a position to write approvingly of the scheme, and to commend the work to the gas industry. There is a way by which the gas industry can show something more than an observer's interest in the new work; and it is on this subject that Sir George Livesey has, through us, addressed to the gas industry the following letter:—

SIR,—You have on several occasions mentioned approvingly the action of the Leeds University in establishing a "Professorship for Fuel, Solid and Gaseous"—thus extending to our industry the advantages they have conferred on other trades, such as dyeing, tanning, leather, &c.

Professor Smithells, F.R.S., Professor of Chemistry at the University, has put the matter before me; and I have led him to hope that the gas industry may provide the stipend of the professorship of fuel and gas, to which Professor W. A. Bone, F.R.S., has been appointed.

Discussing the matter with Mr. Corbet Woodall, we felt that the Gas Committee of the Leeds Corporation should head the list of subscriptions. The Corporation subscribe largely to the University; but this is to be a special subscription in addition. I wrote to the Chairman of the Gas Committee; and an annual contribution of £100 a year has been promised. The Gaslight and Coke Company and the South Metropolitan Gas Company follow with similar subscriptions; and I think I may promise £20 a year from the South Suburban Gas Company.

I thought of writing to certain gas companies; but, on coming to the point, I find myself in a difficulty. I never have made a personal appeal for money, and cannot begin now. I must, therefore, simply state the case through your columns, in the hope that the Gas Committees of the great Yorkshire towns will follow the example of Leeds, and that a number of Gas Companies will also help to raise the remaining £200 (or thereabouts) to make up an annual sum of £500 in subscriptions ranging, say, from £5 to £20 or £25. If a larger sum is offered than is necessary, the individual subscriptions shall be reduced proportionately to the business of the contributors.

I think the Institution of Gas Engineers might be asked to undertake the work of collecting the subscriptions in future if, as I hope, the gas industry responds to this appeal.

*Sept.* 7, 1907. GEORGE LIVESEY.

ANNUAL SUBSCRIPTIONS PROMISED.

| | |
|---|---|
| LEEDS CORPORATION GAS COMMITTEE . . . . . | £100 |
| GASLIGHT AND COKE COMPANY . . . . . | 100 |
| SOUTH METROPOLITAN GAS COMPANY . . . . . | 100 |
| SOUTH SUBURBAN GAS COMPANY [expected] . . . . . | 20 |

## EXHIBITIONS AD NAUSEAM.

### A Proposed Gas Section at the Franco-British Exhibition.

THE manufacturers of gas plant and appliances have shown a laudable willingness to co-operate in all work having for its object the welfare of the gas industry, in the fortunes—good or ill—of which they have part. For what they have of late years done, and are going to do immediately at Manchester, the gas-supply portion of the industry are deeply thankful; and we feel the gas-supply industry, as well as the gas plant and appliance manufacturers, will be with us in making at once a protest against any effort to encroach further upon the time, the good will, and the pockets of the latter.

There is to be at Shepherd's Bush next year what is to be known as the Franco-British Exhibition. With that exhibition, the name of Imre Karalfy is associated; and Imre Karalfy's name stands for spectacular effect and entertainment on the large scale. Primarily, the exhibition will be given up to amusement; but there are broad acres to be filled at Shepherd's Bush, and much money is required. It is therefore proposed that engineering should take a secondary place in the exhibition; and that the gas industry should supply a section. We have no quarrel with the promoters of the Franco-British Exhibition. We wish every success for the main part of their proposed show—the conception of which at the present time was clever; but we are not prepared to support in any way the second part of their venture. Sympathy has ever been evinced in these columns with industrial exhibitions, with entertainment in a secondary position; but we do decline—and it is hoped there will be general endorsement in the gas industry—to be parties to the industry occupying by representation the position of a sort of side-show in an exhibition which will be chiefly designed for the amusement of the public. Under such conditions, industry cannot harmonize with entertainment; and we feel sure that no possible good for the former can come out of the exhibition. With Earl's Court, Dublin, and the forthcoming Manchester Exhibition, we can for a period rest satisfied; and when another Gas Exhibition is required to publicly expose fresh achievements, the gas industry can, and will, afford to run it without the aid of outside promoters and public entertainers. The Society of British Gas Industries are co-operating with the Manchester District Institution of Gas Engineers in the promotion of the Manchester Exhibition; and in view of this we feel every confidence in saying that the Council will not lend their official countenance to the promotion of a Gas Section in the Franco-British Exhibition. The support or the abstention of the Society in the future will either make or mar an exhibition of the kind.

It is urged that if gas does not exhibit, the electrical industry will step in. And what if the electrical industry does—well, let it. There need not, however, be any fear on that score. The electrical industry is busy with an exhibition at Manchester next year; and there is no desire to have two on hand at one time. We are with the "Electrical Review" in this matter; and our contemporary is dead-against the electrical industry binding itself up in the Franco-British Exhibition. There is one suggestion we may make here: If the authorities want the exhibition lighted in an attractive and economical manner, we have no doubt that some of the lighting firms of the gas industry will be pleased to quote tempting prices for the service. Otherwise the gas plant and appliance manufacturers will not, we are certain, desire to be committed to Shepherd's Bush for several months during the summer of next year. The length of time, and the period of year, were the disadvantages in organizing the Gas Section of the Dublin Exhibition, which is an altogether different thing from that proposed by Imre Karalfy and his promoting friends, whose influence has secured the use of names (as patrons) of men standing in high esteem in the country. But this is a matter that has to be looked at from the commercial and industrial points of view, and not from those of the promoters.

## LEGAL AND MORAL RIGHT OF GAS SUPPLY.

THE ruptured relations of, and the contest that has arisen between, the Long Eaton and the Draycott Gas Companies (the subject of two brief references in the "JOURNAL" last week) present a condition of affairs that we believe is without parallel in the history of modern gas supply. It is, as a rule, an excellent thing to suspend judgment until both sides to a cause are heard. But in this case we have before us the parliamentary history of the two Companies; and there is no difficulty in drawing from that history and the existing position of affairs a conclusion as to who are the transgressors.

The whole position is the result of neglect or indifference years ago in the case of the Long Eaton Gas Company, and of the stupid inconsistency of Parliament in granting in this instance dual powers for gas supply. The position is so peculiar that it is necessary to mention a few of the facts bearing upon the matter. The Long Eaton Gas Company were formed some 43 years ago; and in 1880, they obtained a Provisional Order, which defined an area of supply including, among other outlying areas, Draycott and Breaston. Seven years later, gas was required in Draycott. But the Long Eaton Gas Company took no steps to furnish it; and a local Company was formed. If it had not been for this enterprise, Draycott might have been left derelict to the present year, so far as gas supply is concerned. In 1888, the Draycott Company obtained an Act of Parliament, which gave them powers of supply in, among other places, Draycott and Breaston. This is the occasion when the Long Eaton Gas Company virtually, if not in express terms, surrendered their title to Draycott and Breaston by not appearing in opposition to the Draycott Bill. This is the first stage. The Long Eaton Gas Company did not attempt to supply Draycott and Breaston during the seven years following the granting of their Provisional Order; they did not resist the establishing of another Company there; nor did they appear in opposition to the granting of statutory powers to the Company. There was no objection; and silence gave consent. If the Long Eaton Company had been in occupation, Parliament would never have granted powers to the Draycott Company. The Company were, in fact, in possession of statutory powers for some years while the Long Eaton Company were still operating under a Provisional Order. It was in 1901 that the Long Eaton Company applied for an Act, in which they mapped out a district still embracing Draycott and Breaston, notwithstanding that their prior inertia had morally deprived them of all right to the district or to assail in any way those in possession. The Draycott Company petitioned against the Act; but the Court of Referees—with their traditional inconsistency—refused to grant them a *locus;* and thus it came about that over this one district two Companies are clothed with legal powers of supply.

Now the Long Eaton Gas Company—27 years after they first (by Provisional Order) obtained powers of supply, and 20 years after the establishment of the Draycott Company, and 19 years after the latter started to work under an Act of Parliament—have run their mains into the Draycott Company's district, and are competing with them. They do so in a manner which is

diametrically opposed to custom and parliamentary practice in the matter of differential prices as between the primary district and the outlying areas. The Draycott Company have served their area well in regard to price. With discount, the ordinary consumers in Long Eaton have been paying 2s. 8½d. per 1000 cubic feet; the Draycott Company have gradually reduced their ordinary price until it has got down to 2s. 6d. Now the Long Eaton Company have run their mains 2 miles into the Draycott Company's area, and are offering to supply at 2s., and to give other advantages to those who will patronize them, and so have forced the Draycott Company, who have carried out their powers faithfully, to level-down their already low terms. But in Long Eaton, the price remains for ordinary consumers at 3s., less 10 per cent. discount. That is an inversion of parliamentary practice, which allows a price to be charged in outer districts higher than that obtaining in the main part of the supply area; and it is opposed to the modern condition that rebates from the ordinary price are to be uniform under similar circumstances of use. We feel sure that Parliament, if the matter could be submitted to them, would discountenance what the Long Eaton Company, as a statutory concern, are now doing. The Long Eaton consumers will not long approve these tactics, which give to new and outlying customers gas at a cheaper rate than to the home consumers. If the Long Eaton Company can afford to supply, along two miles length of main in the Draycott Company's district, gas at 2s. per 1000 cubic feet, then they can better afford to supply nearer their works at a lower price than 2s. Cut-throat competition of this kind never did, in the end, work any good to the gas consumers nor to the gas vendors.

What is the object of the Long Eaton Company in taking this action? If it is only an old-age repentance, then honour ought to have stayed action. Perhaps, however, the Company now covet the Draycott Company's area, and are attempting to depreciate their property, or to starve or crush them out. But the Company in long-standing possession are the stronger, and (shall we call them?) the freebooters are the weaker; and their weakness is shown by the length of time that has elapsed before entering the district, and the big sop they have to offer in the shape of (looking at the ordinary charge for gas in Long Eaton) an uncommercial price to draw custom from the Draycott Gas Company. However, whatever the purpose of the Long Eaton Company, whatever the upshot of their action, sympathy will be on the side of the Draycott Company, who have both legal and moral right on their side, while the Long Eaton Company have only legal right, which we make bold to say they would not have maintained if the matter had been submitted to the decision of a Select Committee in 1901. There is a legal maxim "*Æquitas sequitur legem.*" This is decidedly a case in which equity should prevail, and set right what (unless fresh light can be shed upon the matter other than that which we have gained by looking into the history of the present position) we can only regard as an injustice, the like of which has had no previous existence in the gas industry.

## OBITUARY.

The death occurred on the 31st ult., as the result of an attack of pleurisy and congestion of the lungs, of Mr. W. P. HOTCHKIN, who for 23 years held the position of Manager of the Coggeshall Gas Company. He leaves a widow, two sons, and three daughters.

The death took place last Thursday, at Gawber, near Barnsley, of Mr. JOSEPH TAYLOR, who was three times Mayor of Pontefract, of which town he was a native. Much of his time was devoted to the affairs of the Pontefract Gas Company, in connection with which he occupied the position of Chairman, until the undertaking was acquired by the Corporation this year. For six years he represented Pontefract on the County Council; and he was placed on the Commission of the Peace in 1883.

The current number of "Le Gaz" records the death, on the 3rd ult., of M. CHARLES MARIEZ, the Engineer of the Nancy Gas-Works. It will probably be remembered that the annual meeting of the Société Technique du Gaz en France was held at Nancy last June; and in connection with the report of the proceedings which appeared in the "JOURNAL," a sketch was given of the development and progress of the gas-works. M. Mariez was born in 1843, and left the École Centrale in 1868 with the diploma of Engineer of Arts and Manufactures. His first engagement was with the Compagnie des Chemins de Fer des Charantes; but in July, 1879, he was entrusted by M. Ellissen with the management of the gas-works of the Continental Gas Company at Evreux. When the Company became co-proprietors of the Nancy works, which had been established by the Constantin family, he was associated with the management in October, 1883; and such was the confidence placed in him that he was allowed to have the entire control. On the death of M. Jules Constantin in 1889, the Nancy Gas Company appointed M. Mariez their Manager; and under him the concern made rapid progress. He carried out a number of extensions, and introduced plant of the most approved kind, as shown by the accounts which have appeared in our pages. It was acknowledged, on the occasion of the visit of the French Society in June, that everything upon the works bore witness to the able control of the Manager; and his death will, we are sure, be much regretted, as well by the Company he served as by his professional colleagues, whose sympathies will be extended to the family in the great bereavement they have sustained.

## GAS STOCK AND SHARE MARKET.

**(For Stock and Share List, see p. 719.)**

THE general condition of affairs on the Stock Exchange last week presented no very stable characteristic, but rather a variety of fitful movements. At the same time, the volume of business was so extremely limited that these movements were not sharply perceptible. The sluggish tide alternated up and down, and never for long at a time—perhaps going one way in the morning, and the other way in the afternoon. It was a short week, too (the Exchange being closed on Saturday), and that helped to tame things down. The opening on Monday looked fair, and there was some buying of good investment stocks. But Consols were not among them, and closed ⅛ lower. Railways also were not good; the advance in the price of coal being suggested as a bad point. Tuesday was a very slack day; but the tone on the whole was tolerably cheerful, though the gilt-edged division did not share in it. Wednesday afforded promise of greater briskness. It soon, however, subsided; and by the end of the day any little advance was mostly lost. Things were perhaps quieter than ever on Thursday, and sheer inanition produced a degree of dulness. Friday was a change for the better—some little buying in choice lines having a beneficial effect. Consols recovered ⅛. In the Money Market, there was an abundant supply, and terms for short loans eased away materially. Discount rates took a harder turn at first, in view of gold being secured for abroad; but later on an easier condition ensued. Business in the Gas Market was quite on a holiday scale, and there was hardly any alteration in quotations. But the tone was quite firm; and the two or three variations marked were all in the upward direction. In Gas-light and Coke issues, the ordinary was lightly dealt in at close figures, which did not range outside the limits of 93½-94. The secured issues had their full share of business. The maximum changed hands at from 86 to 87½, the preference at from 104½ to 105¼ (a rise of 1), and the debenture at 81½. South Metropolitan was moderately active, and advanced half-a-point; transactions ranging from 119 to 120½. The debenture was done at 81½ and 82½. In Commercials, the 4 per cent. was marked at 102, and the 3½ per cent. at 101 (after a small parcel had been done free at 99). The debenture marked 81 free and 82. Hardly anything was transacted in the Suburban and Provincial group. Tottenham "B" changed hands at 101½, and West Ham at 103¼. The Continental Companies were very inactive. Three or four deals in Imperial were done at from 174½ to 175½; and one in European fully-paid at 22¾. Among the undertakings of the remoter world, Bombay was marked at 6⅝ and 6½, ditto part-paid at 4 13/16, Buenos Ayres at 11⅛, Melbourne 5 per cent. at 101⅜, Primitiva at 6 15/16, ditto preference at 5, ditto debenture at 94½ and 94¼, and River Plate at 13⅜.

## ELECTRIC LIGHTING MEMORANDA.

**Increase of Electrical Accidents—Fatalities at Low Pressure—A Scientific View of the Physiological Influence of Electrical Currents—Home Office Regulations—New Lamp Developments.**

MUCH matter of importance has of late occupied attention in the "Memoranda;" and consequently notice of the electrical section of the recently issued annual report of Mr. G. S. Ram, Inspector of Factories, has had to be withheld until now. It is regrettable to find that the electrical accidents reported as having occurred in engineering works, &c., show a considerable increase over those of the previous year; the number having risen from 122 to 199, or over 60 per cent., including eight fatalities against four in the preceding year. To the expansion of the industry, the increase is partly due; but at the same time those engaged in the electrical industry cannot be acquitted of all blame for not taking greater precautionary measures. Rules and regulations are made for wiring and fitting up; but who enforces them? Mr. Ram would not have so much room for criticism if electricians would be less academical, and somewhat more practical. We are not exceeding the limits of fair criticism in saying this when we find Mr. Ram remarking: "The increase is scarcely to be wondered at in view of the fact that the necessity of proper precautions being taken is often not realized by the occupier, who accepts the lowest tender for his installation without being aware that the price is low because the apparatus is inferior, and often without the elementary safeguards." Also, later on, the Inspector condemns the dangerous character of some of the arrangements —"death traps" is an expression used in one part of the report—at electricity generating stations. How is it possible to reprimand the consumer when such faults are found in the electrician's own particular domains?

Regarding the protection afforded the uninformed user of electricity, it is seen that, of the total number of accidents already quoted, "faulty apparatus," other than switches, was responsible for no less than 37 non-fatal accidents and two fatal. The somewhat more numerous accidents under this heading occurred, with one or two exceptions, in connection with the use of portable appliances—generally lamps. The injuries were most severe burns to the hand due to short-circuits occurring in the plug or the lamp fitting, or in the flexible wires where they enter the plug or lamp fitting. The severity of many of the burns is undoubtedly

due to the circuits being too heavily fused; thus allowing very heavy currents to flow under short-current conditions. Wherever portable appliances are used in places where the persons handling them are not insulated from earth, special precautions, Mr. Ram urges, should be taken, as there is always a possibility, or even a probability, that there will be a leakage in the portable appliance. As is evident by two fatalities quoted by Mr. Ram, the person holding the lamp or other appliance may be unable to drop it, and a fatal shock is the result even where low pressures are used. The common pressures nowadays are 200 to 230 volts; and it was at these respective voltages that the fatalities occurred to which Mr. Ram refers. In a later portion of the report, it is found that all fatal accidents recorded as having taken place on factory premises were due to shock from alternating current, at various pressures down to 200 volts; no less than four occurring at this pressure. It is customary when fatalities happen at such low pressures for people to say that the victims must have had weak hearts. But Mr. Ram asserts that this view is seldom confirmed; the post-mortem examination often proving the contrary. The danger with low pressures depends upon the path of the current through the body and the kind of contact. People who are responsible for electrical installations do not sufficiently realize the hidden dangers of low-pressure currents; and hence the weak-heart theory is trotted out at every inquest. The danger should not be minimized by trying to shift its effects on to another cause; better will it be to utilize the known danger to bring about a greater perfection in installation fittings and appliances, care in workmanship, and a better recognition that electrical fittings will not last for ever. As the "Electrician" puts it, "faults are liable to occur in due time in all apparatus through wear and tear." An instance of this was afforded by an inquest held at Newcastle the other day. The subject was John Allan, who lost his life through electric shock. The deceased man was proceeding to attend to an electric pump at a colliery at Ashington, when he found a cable hanging from the roof. On lifting it, he immediately fell. The cable had a few days before been examined by "the eye;" but subsequent to the accident, a more thorough inspection was instituted, when it was discovered that the insulation was damaged. The Electrical Engineer considered that this could only have occurred by reason of electric current leaking from one coil of the three-coil cable employed. The outside covering of the cable was found to be burnt for about 1½ inches.

While on this subject of accidents, it may be noticed that Herr Hermann Zipp, lecturer at the Municipal Polytechnic at Cöthen, has been considering the danger to human life introduced by accidental contact with an electrical current; and he comes to the conclusion that the extent of the injury is not entirely due, as is generally imagined to be the case by non-technical people, to the voltage of the current, but partly or mainly depends on the quantity of electricity which is caused to flow through the human body, and upon parts of the system which it penetrates. Experiments that have been carried out on the physiological influence of electrical currents show that part of their effect is due to their electro-chemical action upon the liquids of the body, and part to the injury done to the most important organs by contact with the current of electricity. Herr Zipp enjoins special care in using portable electrical apparatus such as hand-lamps and motors when the atmosphere is damp.

Within a few weeks after the issue of Mr. Ram's report, there comes to hand the draft of the regulations proposed to be made by the Home Secretary for the use of electricity in factories and workshops. To publish the regulations and the accompanying matter would occupy some columns of our space; and so we will content ourselves with reference to a few general matters in the preamble to the regulations. The draft applies to all premises under the Factory Act, and to all pressures above 130 volts continuous and 65 volts alternating. In adopting these limitations on the basis of pressure, the Secretary of State, while realizing that there may be danger at still lower pressures, has been guided by the fact that the serious accidents from shock which have come to his notice have been at pressures exceeding those named. Special consideration has been given to the conditions under which preventable accidents have arisen. The Secretary of State regrets to learn that, while in many electrical installations the utmost care has been taken to prevent unnecessary danger, there are striking exceptions to this rule, even in work recently carried out. It appears to be often thought that, where the supply of electrical energy is at low pressure, there is no danger of shock, or rather there is no danger to life from a shock at such pressure. It has, however, been abundantly proved (by Mr. Ram's reports for example) that this is not the case. Fatal cases of shock at low pressures are by no means of rare occurrence. Accidents from shock may occur by a person making contact simultaneously with two live conductors at different pressures, but more usually by merely touching one conductor while being in contact with the ground. Mere momentary contact with a conductor at low pressure, even when standing on damp ground, may not produce a serious shock. But a person who happens to grasp the conductor may be quite unable to release his hold; and the shock is prolonged until assistance comes. In such circumstances, it may take only a few seconds for the shock to prove fatal. The dividing-line between the conditions which will render the shock merely trifling and those which will render it fatal, is so narrow that it becomes necessary to provide, so far as is practicable, that no shock shall be received at all. However, with all this attention to the precautions necessary in installing electricity, and with the lengthening record of accidents happening under varied and new conditions, the harmlessness of electricity continues to be proclaimed.

It was in accordance with the fitness of things that the developments in electric incandescent lamps should have been brought before the meeting of the British Association at Leicester. The task was undertaken by Mr. Leon Gaster, whose name is continually coming forward in connection with matters affecting illumination—especially electrical. One feature of the paper is that Mr. Gaster does not take an inflated view of the prospects of the new metallic filament lamps, but as becomes an electrician he treats them in a hopeful spirit. He points to the fact that no great further improvement has been effected in the efficiency of the Nernst lamp, and mentions that Welsbach's "Osmium" lamp, owing to the expensive nature of the metal used, and to the difficulty of manufacture, is likely to be restricted to low voltages. The "Tantalum" lamp is the only metal filament lamp which has proved commercially successful; but it is only made for voltages up to 125. Mr. Gaster speaks with more confidence of the tungsten (wolfram) lamp; but he puts his finger on a weakness of the "Osram" lamps (also for low voltages) when he says that they have to be used with the filament in the vertical plane. This led him to describe an improvement (about which we have doubts as to its permanency) in connection with the zircon-wolfram lamps, whereby they have been rendered fit for use in any position. The filaments are mounted on spring hooks made from tungstenized carbons. The hooks have the effect of maintaining the filament rigid and in shape while in service, and of preventing the loops from touching, also of allowing a greater number of filaments in a bulb, and consequently of reducing their length as well as that of the lamp. Mr. Gaster gives his authority for stating that the elasticity of the spring hooks has "reduced" the breakage of filaments, both in transit and in service. The latest type of 110-volt lamp is made to contain only four filaments, measuring 0·025 mm. in diameter, giving 24 Hefner units, or for 220 volts 48 Hefner units, necessitating the use of eight filaments. The helion lamp is one about which the author speaks a little more definitely.

This particular creation looks like an ordinary carbon incandescent lamp, and with the same sized bulb. But, unlike the carbon filament, it only consumes 35 watts, and returns something like 30-candle power. In the manufacture of the filament, silicon is reduced from the gaseous form in combination with carbonaceous gases on the surface of a high-resistance carbon core. A useful life of between 600 and 1000 hours is claimed; but a proper series of life-tests has not been made, as there seems to be a difficulty in keeping the joints between the filament and the leading-in wires in good condition. If there is not one defect in these new lamps, there seems bound to be another. Like other lamps of the new type, great care has to be taken in the selection of the carbon core and in manufacture; otherwise the results are considerably affected. The filament, however, is very pliable; and Mr. Gaster asserts that "there will be no difficulty (if the present defects, which are chiefly of a mechanical character, are overcome) in making lamps of low and high voltages, and of reasonable candle power." The great point about Mr. Gaster's paper is that the manufacturers of the metallic filament lamps are working their way up to the higher voltages; but there are many "ifs" about the later lamps, much that is merely tentative, and commercial certainty is not within grasp. It is understood that it is not the intention of most of the manufacturers to sell for the present other lamps than those of "high" illuminating power (above 30 candles), and for voltages varying between 100 and 130. So the position has not really changed; and many are still searching for an answer to the question as to how the new lamps are going to benefit, in a tangible way, the British electricity industry.

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**Artesian Wells in Australia.**—According to an article in "Engineering," the first actual discovery of artesian water in New South Wales dates from 1879, when a supply was obtained on a pastoral holding between Bourke and Wilcannia, at a depth of about 140 feet—the water rising in the pipes to a height of 26 feet above the surface of the ground. The success of artesian boring was, however, first demonstrated on an extensive scale at Kerribee station, where a bore was sunk to a depth of 1073 feet, which yielded 350,000 gallons per day. The first Government bore was sunk in 1884 at Goonery, on the Bourke-Wanaaring road to a depth of 89 feet, with a resulting flow of 24,000 gallons per day. The two bores previously mentioned were made by private individuals. Since 1884 the manifest advantages of the artesian wells have been so evident that, in spite of the great difficulties of transport and the cost of boring in the earlier stages, as many as 412 bores have been sunk in this State, 54 of which are subartesian, and require mechanical means for raising the water to the surface. The failures among these bores have been about 10 per cent.; there having been 41 failures out of the 412 bores. Among the failures, however, are included test-bores, and bores put down against expert advice. In the matter of enterprise in this direction, when compared with the neighbouring State of Queensland, New South Wales shows a good record; for out of the 412 bores put down, 130 of them have been sunk by the Government against (approximately) 120 in a total of 1132 in the State of Queensland.

# THE ILLUMINATING POWER, IN ORDINARY AND INCANDESCENT BURNERS, OF COAL GAS, WATER GAS, AND MIXTURES OF THE TWO GASES.

By M. Emile Sainte-Claire Deville.

**[Abridged Translation, with Comments, by W. J. Atkinson Butterfield, M.A., F.I.C., of a Communication presented to the Meeting of the International Photometric Committee in Zurich, July 18 to 20.—Continued from p. 626.]**

*Water-Gas Tests.*—Work on lines indicated in the preceding paragraphs was carried out on coal gas only in 1901 and reported in the author's communication in 1903.* It was extended to water gas and mixtures of water gas with various proportions of coal gas in 1904. But the procedure was altered slightly. In 1901, a Foucault photometer with two bars and an electric glow lamp as a secondary standard were used; but by 1904 the laboratory had been entirely remodelled. A Welsbach burner No. 2, with governor, was adopted as the secondary standard; and the photometer was a single bar, 5 metres (=16·4 feet) in length. A Simmance and Abady pattern photometer was used on this bar for comparing the secondary standard with the Carcel lamp; and a simple reflecting photometer formed by the edge of a meerschaum prism was used for comparing the burner under examination with the secondary standard. This proved quite satisfactory. The general arrangement is shown in fig. 3. In this plan, A represents the auxiliary

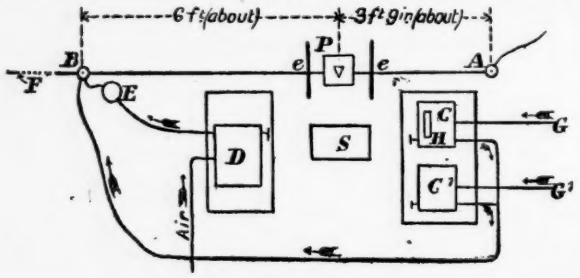


Fig. 3.

standard set up at the zero of the photometrical scale. This standard was a governed No. 2 Welsbach burner, consuming the ordinary gas as supplied to Paris. B is the test burner, with artificial supply of air, movable on the bar. A F is the photometric bench, which extends beyond F to a total length of 5 metres (=16·4 feet), and is furnished with a scale. P is the meerschaum prism photometer, which travels on the bar. A Simmance and Abady photometer can be placed on the same carrier. Two black screens, *e e*, travel with the photometric prism, having openings in the line of the photometer. The observer sits at S. H is a seconds clock; G is the supply-pipe; and C is the meter for gas No. 1, and $G^1$ and $C^1$ the pipe and meter for gas No. 2. D is the air-meter, and E a desiccating tower through which the air is passed. The "Bébé" type of mantle was employed in 1904, instead of the "No. 1" mantle used in 1901, and was of better quality intrinsically.

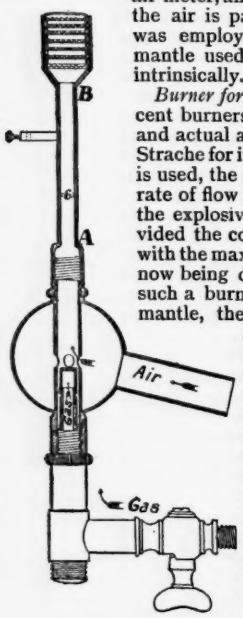


Fig. 4.
Burner for No. 1 Mantle (about one-third natural size).

*Burner for all Kinds of Gas.*—Ordinary incandescent burners are inapplicable with neat water gas, and actual argand burners have been used by Dr. Strache for it. But if a burner with artificial air-feed is used, the mixture of air and gas may be given a rate of flow in excess of the rate of propagation of the explosive wave in the opposite direction, provided the consumption is as high as is consistent with the maximum duty, which is the only condition now being dealt with. The author has produced such a burner in two sizes—one for the "Bébé" mantle, the other for the No. 1 mantle. The one for the "Bébé" mantle answered best; and it was also convenient to use this mantle because its lower consumption admitted of a greater number of tests being made from the gas contained in a small holder. The larger burner was liable to light-back occasionally, and required a little modification to overcome this defect. Fig. 4 shows the burner, which differs from that used with the "Bébé" mantle only in respect of size. The essential dimension, however, is the internal diameter of the tube A B; and this is 6mm. (about ¼ inch) in both burners. The head of the burner contains rings of metallic gauze, surmounted by a perforated top.

*Variations in the Duty afforded by Neat Water Gas according to Proportion of Air.*—Before passing on to the specific duty of particular gases, it may be best to show that the proportion of air plays the same part with water gas as with coal gas. Using a "Bébé" mantle, Brand "A," No. 4, with water gas of good quality having a calorific power of 2699 calories per cubic metre (303¼ B.Th.U. per cubic foot), and requiring 2·31 times its volume of air for complete combustion, the results shown in the following table were obtained in December, 1904. (The corresponding figures for coal gas were given in Table III., on p. 625.)

| Consumption of Gas. Cubic Feet per Hour. | Volumes of Air per Volume of Gas. | Illuminating Duty. | |
|---|---|---|---|
| | | Candles per Cubic Foot. | B.Th.U. per Candle. |
| 10·66 | 1·80 (*a*) | 14·33 | 19·2 |
| ,, | 2·06 (*b*) | 16·40 | 16·8 |
| ,, | 2·23 (*c*) | 14·74 | 18·7 |
| 13·35 | 1·79 (*a*) | 14·26 | 19·3 |
| ,, | 2·03 (*b*) | 16·67 | 16·5 |
| ,, | 2·24 (*c*) | 14·56 | 18·9 |
| 15·54 | 1·76 (*a*) | 13·30 | 20·7 |
| ,, | 2·03 (*b*) | 17·33 | 15·9 |
| ,, | 2·29 (*c*) | 14·03 | 19·7 |

(*a*) Inadequate air supply; (*b*) correct do.; (*c*) excessive do.

The foregoing testings were all made under the conditions of absolute maximum duty corresponding with the horizontal portions of the curves in figs. 1 and 2 (p. 626). They show that the proportion of air which affords the specific illuminating duty of the water gas is 2·04 volumes to 1 volume of gas.

*Procedure Adopted for a Series of Testings.*—The specific illuminating duty was determined for several gases one after the other under identical conditions in this manner: Meter C supplies No. 1 gas, which is coal gas; and Meter $C^1$ supplies No. 2 gas, which is neat water gas. The secondary standard was always assumed, for the sake of simplicity in the calculations, to have a value of 6 carcels (= 58·8 candles), though in reality comparisons showed that its mean value was about 6·3 carcels (= 61¾ candles). The absolute value is not of much moment for the present purpose. The Welsbach light that was used as a secondary standard remained quite constant in intensity throughout the short time required for a complete series of testings; and that is the essential point. The distance of the standard burner on the photometer-bar is fixed beforehand, so that for an absolute intensity of from 15 to 18 carcels the prism or photometer proper is immediately in front of the observer's chair, which is placed so that he can readily control the taps of the three meters. The gases are burnt for some time through flat-flame burners, in order to clear the meters; and the standard is lighted at least half-an-hour beforehand. After these preliminaries, the specific duty of the coal gas (No. 1) is determined by turning on the gas to the burner, then the tap on the air-meter, and lighting.

On adjusting the taps systematically, it is found in practice that in about one minute the intensity can be made such that the two faces of the prism are equally illuminated when its carrier is shifted only a little (that is to say, the intensity of the light is between 15 and 18 carcels, or, say, 150 and 180 candles), while the air supply is such that it cannot be appreciably altered either way without lowering the intensity of the light. Then by an observation occupying three minutes, all the necessary data for calculating the specific duty are obtained. Then, by gradually turning off gas No. 1, and at the same time turning on gas No. 2, water gas is substituted for the coal gas without putting out the burner. The regulation of the gas and air supplies is carried out as before; and the three-minutes observation is then made. Afterwards testings are carried out with mixtures of coal gas and water gas in proportions as indicated by readings of the two meters; and the changes from coal gas to water gas and to various mixtures of the two may then be rung as often as desired, until the observer's eyes become fatigued, or the air-holder is emptied.

In the laboratory, analyses of the two gases and determinations of the calorific power and specific gravity of the supply are carried out while the photometric observations are in progress. The theoretical temperature of the flame is calculated from the analysis by Le Chatelier's method, as well as the proportion of air requisite for complete combustion. If these determinations are made on the two neat gases, the corresponding figures for the various mixtures of the two are readily calculated from the proportions. The results of a series of observations are then tabulated in the order of descending flame temperature and ascending calorific power—that is to say, commencing with water gas and proceeding through mixtures gradually increasing in their content of coal gas to coal gas itself. The results of five such series of observations, with coal gas and water gas of varying qualities, are presented by the author in detail in lengthy tabular statements. [A summary of these will be given next week.—Ed. J.G.L.].

* See "Journal," Vol. LXXXIII., pp. 499, 567, 617.

# TRADES UNION CONGRESS.

### Points from the Bath Gathering.

It is the general custom for the annual Trades Union Congress to receive a certain amount of preliminary advertisement; but this year perhaps the notice given to the approach of the event by the general Press was rather more extensive than usual, owing to the fact that there had been a "split." In 1905, the Amalgamated Society of Engineers and the Durham Miners' Union, after some years' absence, decided to again take part in the proceedings of the congress; but on the present occasion the former body once more expressed their inability to join in the gathering. However, in spite of this very unkind action, the usual speeches were made, and the customary resolutions were passed, at the fortieth annual congress, which was held last week at Bath. In fact, it is reported that, in spite of the severance of the Society of Engineers with its 100,000 members, the number of Trade Unionists represented was a record. There were 521 delegates, which was an increase of 30 on last year; while the Trade Unionists represented numbered 1,693,000, as compared with 1,550,000. At first sight, one might wonder whether this increase was solely due to the fact that on this occasion the congress possessed a new feature, in the shape of the inclusion of the representatives of the various organizations connected with the theatrical profession. On going more closely into the matter, however, one learns that there has been a general advance in membership of the various Unions; the most striking increases being 30,000 miners and 12,000 railway servants. Those who have, even casually, followed recent proceedings in the colliery districts, and have noted the determined efforts of the Miners' Federations to force all non-Unionists into their ranks, will hardly be surprised at the addition to the number of Unionists that has taken place there; while the greater popularity of Unionism among railway servants is, of course, explained by the agitation for better terms of employment which certain leaders have been engaged in on behalf of the men.

At the close of their report on the work of the past year, the Parliamentary Committee naturally had something to say on what has been achieved in respect of the Trade Disputes Act and the Workmen's Compensation Act. But these gains sink almost into insignificance when placed beside the formidable list of social and industrial reforms that the members are now urged by the Committee to "take up," with determination and energy, both inside and outside Parliament. These are as follows: A miners' legal eight-hour day, and a reduction of hours in all trades; old-age pensions; the unemployed question; compulsory State insurance; land nationalization; the amendment of the Poor Laws; and the legal restriction of systematic overtime. The position of greatest urgency is given to old-age pensions, with regard to which the Committee appeal for a vigorous campaign to be held throughout the country during the coming autumn. "Some may say," continues the report, "that the condition of the working classes has improved greatly; but no man will say, who knows anything of the facts, that the state of the people as a whole has advanced in proportion to the increase in the national wealth. Though much has been done, there is still more to do; and in this direction a noble opportunity is put before the Trade Unionists of this country." The welcoming of the congress to Bath by the Mayor (Mr. S. W. Bush), the election of scrutineers, &c., comprised the business of the first day.

The proceedings on Tuesday opened with the address of the President (Mr. A. H. Gill, M.P.), who, with reference to future policy, differed a little from the Parliamentary Committee, inasmuch as he assigned the foremost place to the Miners' Eight-Hour Bill. In considering the question of unemployment, some effort was made to arrive at the causes of the want of work, which Mr. Gill admits is not peculiar to this country. The first enumerated are the extension of machinery, and greater pressure being put upon workmen to get out more work. The result of this pressure, it is claimed, has been that the productive capacity in the various departments has increased by fully 25 per cent. with the same number of workmen in the same time; while the increased demand for commodities has not kept pace with the extra productivity of machinery. Overtime is still put down as another fruitful cause of want of employment. Turning to a solution of the problem, Mr. Gill admits the impossibility of fighting against machinery; and the congress, it is to be hoped, made careful mental note of his candidly expressed opinion that they "can no more keep back the spread of machinery than Mother Partington could keep back the tide with her broom." The course he suggests as a remedy is the concentration of energies towards securing the best possible wages for working the machines; the abolition of overtime wherever possible; in cases of depression, the reduction of the hours of all, rather than the discharge of some men and the retention on full time of others; in trades where depression was most severe, a permanent reduction of hours. As to old-age pensions, the only scheme that will really be satisfactory from the President's point of view will be one that is universal, non-contributory, and non-discriminatory, and that provides not less than 5s. per week at the age of sixty. The question of where the money is to come from—an important one, when the expenditure involved must, on the most favourable of computations, amount to many million pounds yearly—was not a matter with which the President felt called upon to greatly trouble himself. To find the sum necessary is, he said, the duty of the Chancellor of the Exchequer. A suggestion was, however, modestly put forward by Mr. Gill to the effect that if the Minister in question "will turn his attention to the unearned increment which has accrued to landlords from the land, the mining royalties which in other countries go to the State, but which are here appropriated by the landowner, and the large fortunes which are left, and which have been made by the industry of the workers, he will find sources which can be legitimately tapped."

The address having been thus satisfactorily disposed of, the congress settled down to the consideration of the Parliamentary Committee's report; and, as usual, a lengthy discussion ensued. On the question of unemployment, one speaker asked whether the Committee did not think it necessary to draw the attention of the Government to the large number of skilled and unskilled workmen who were being thrown on the unemployed market through the operation of the insurance companies in regard to the Compensation Act. It was, he said, their experience that some of the best men were being thrown out of work because of a few grey hairs or some slight infirmity. In this matter, the Right Hon. John Burns came in for some rather strong criticism from his one-time friends and allies; one delegate going so far as to say that it was the whole intention of the Liberal Government and of Mr. Burns that the Unemployed Act of 1905 should be a failure.

Wednesday was devoted to resolutions; and the first, which was carried unanimously, was ordered to be cabled to Antwerp—to which port it had special reference. One member suggested that, in addition to the moral support (which it is doubtless imagined will be thereby afforded), the congress should dispatch material help to the strikers, in the shape of £500. But this proposal the President declined to accept. The resolution was as follows: "This congress expresses its severest censure upon those Britishers who have thought proper to engage themselves to cosmopolitan syndicates to interfere in foreign labour disputes, believing that such action is purposely adopted by unscrupulous capitalist combinations to generate and foster bad feeling between the workers of different countries, and to counteract the universal tendency of the workers of the world towards comradeship and mutual helpfulness in all matters affecting their international welfare. Further, this congress suggests that the British Government should seek powers from Parliament to apply the principles of the Foreign Enlistment Act to such as organize these blackleg expeditions to other States, and so prevent the possibility of foreign complications arising from such dangerous conspiracies." The House of Lords came in for quite a flattering share of attention; and ultimately it was unanimously agreed to strongly urge upon the Government to take such steps as will secure the abolition of "that privileged assembly," and to protest emphatically against the creation of any further new peerages. Among other matters, it was decided to have a special conference of Trade Unions to discuss the by no means new question of establishing a daily Labour paper. A resolution in favour of the abolition of all overtime was also passed.

The remainder of the week was taken up with the consideration of other matters of character varied enough to please everybody. As the result of an accusation of "sweating" brought against the Salvation Army by the Amalgamated Society of Carpenters and Joiners, the Parliamentary Committee were instructed to open up negotiations with the Army so that an inquiry may be made. Compulsory arbitration in trade disputes was again suggested, in place of that disastrous weapon "the strike." But it met with nothing like general favour; and the idea was rejected after Mr. W. Thorne, M.P., had urged that in practice it was impossible to enforce compulsory arbitration, because while the workers would have to accept an adverse decision, the employers could not in a like case be compelled to keep their factories open. Later on, the Government were unanimously urged to at once embark upon works of public utility, with the object of absorbing the present unemployed labour, and of "laying the foundation for a permanent re-organization of industry upon a co-operative basis."

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**Eastern Counties Gas Managers' Association.**—We learn from the Hon. Secretary of the Association (Mr. T. A. Guyatt, of Ely) that the next meeting will be held at Gravesend on the 26th inst., under the presidency of Mr. J. Davis, the Engineer and Manager of the Gravesend Gas Company.

**Gas from Straw.**—Reference was made in the "Journal" last week (p. 626) to a project set on foot at Beatrice, Nebraska, for the manufacture of gas from straw, corn-cobs, &c. It appears, according to a correspondent of the "Daily Express," that the discoverer of the process is Mr. J. Russell Coults, B.A. of the M'Master University, and the son of a Cleveland Baptist minister who numbers among his flock Mr. John D. Rockefeller; and it is stated that the famous oil magnate is backing up the young man in his venture. The gas is produced in a special generator invented by Mr. W. P. Tarver, of London; and its illuminating and calorific powers are reported to be 24 candles and 660 B.Th.U. per cubic foot respectively. Beatrice is being supplied at the low rate, for the West, of 4s. 9½d. per 1000 cubic feet. The correspondent above referred to states that it is intended to build and operate plants in important centres of the Western States and Canada.

## AMERICAN GAS INSTITUTE.

### Programme for the Second Annual Meeting.

We learn from the last number to hand of the "American Gaslight Journal" that the second annual meeting of the American Gas Institute will be held in Washington from the 16th to the 18th prox., under the presidency of Mr. Walton Clark, of Philadelphia. A full programme of papers and reports has been issued by the Secretary (Mr. J. W. Dunbar). Taking the papers first, the list is as follows:—

"Depreciation." By Dr. A. C. Humphreys.
"The Obligations Imposed by the Possession of a Franchise." By Mr. Charles H Dickey.
"Instructions for Operating Recuperative Benches." By Mr. W. A. Baehr.
"Experiments in Carbonization." By Mr. W. H. Fulweiler.
"Experience in Omaha on Delivering Uniform Candle Power to Consumers." By Mr. George H. Waring.

Reports from the following Committees will be presented: Methods of Taking Candle Power, by Mr. W. H. Gartley; Public Policy, by Mr. E. G. Cowdery; Making Rates and an Additional System of Costs, by Mr. W. H. Gardiner; Economic Balance between Calorific Value and Candle Power, by Mr. Thos. D. Miller; Revision, by Mr. W. H. Shattuck; Electrolysis, by Mr. A. G. Glasgow; Pipe Standards, by Mr. Walton Forstall; and Uniformity of Meters, by Mr. C. H. Dickey. A communication will be submitted by the Committee of the New England Association on the subject of "Uniform Accounting and Depreciation;" reports will be presented from Baltimore, Philadelphia, and Savannah on "Experience with Dipping Meters;" and one from Philadelphia and Kansas City on "'A' Meter Results." In addition to the papers and reports enumerated above, there will be a lecture on "Electrolysis," by Professor A. F. Ganz.

## COLOUR IN ILLUMINATION.

Increasing interest in the colour character of artificial lights is being manifested in the field of practical illumination. The subject is from time to time referred to in papers and discussions on illumination; and it is not unusual in reporting tests of new lighting agents—more particularly of electric lamps—to state the predominant colour of the light given. The colour of artificial illuminants is indeed of considerable importance from several points of view. It frequently affords a different physical conception of one's surroundings to that obtained in broad daylight. The tints of pictures, wall papers, dress and other materials, are altered, although it may be in varying degree. Coloured fabrics which have been matched in daylight do not necessarily agree in hue when judged at night. Some attention was drawn to these facts by Mr. G. H. Stickney, when recently lecturing before the Illuminating Engineering Society (see "Journal," Vol. XCIX., p. 566). The subject is worth pursuing further; and some of its phases are dealt with by Mr. J. S. Dow, and Dr. Louis Bell in a recent number of the "Illuminating Engineer" magazine.

Mr. Dow anticipates that in the development of light sources we shall eventually be able to control the spectrum of our illuminants—deciding not only the nature of the spectrum which will give the best results in illumination, but also the particular portions most serviceable for particular uses. In view of the fact that, in the wide range of present-day methods of illumination, artificial lights of varying predominant colours are obtainable, and that these can be modified to some extent by either chemical or physical means, there would seem to be some ground for the belief.

The probable ultimate realization of such control, however, still leaves many questions unsettled as, for instance, the nature of the illuminant best suited for general, and also that for special purposes. It may even be a point whether the suggested ideal of artificial daylight (which virtually means prolongation of the daytime) will not indirectly cause overstrain or other trouble of the eyesight. It would seem that differences in the intensity of daylight have some effect; for a comparison of the visual acuity of men coming from different climes is said to have indicated better vision in those coming from cloudy than from sunny districts. In any case, daylight—in character as well as intensity—has its variations. Colours compared in the light of one kind of daylight seem to be different in the light of, say, a late afternoon sun. Dr. Bell points out that the light of the sky is rich in blue rays. Daylight, as we know it—even in the full sunshine—has a bluish cast compared with sunlight, and diffused daylight by itself is strongly blue. At the present time, however, artificial daylight is not, economically speaking, easily procurable—illuminants with a preponderance of yellow light still being the cheapest to produce.

Mr. Dow draws attention to the fact that at ordinary illuminations the greatest luminous efficiency is in the neighbourhood of the yellow of the spectrum; and he furnishes a diagram (fig. 1) showing by curves (obtained respectively by Sir William Abney and Mr. Nicholls) the distribution of illumination and energy in the solar spectrum. From this it will be seen that light rays

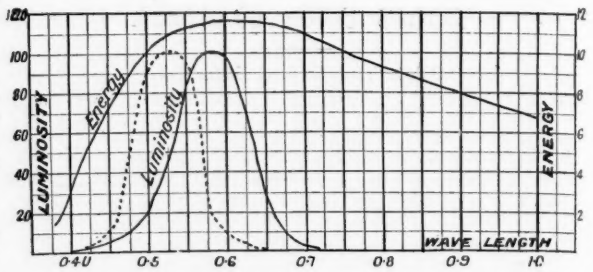



Fig. 1.—Curve Showing Distribution of Illumination and Energy in the Solar Spectrum.

starting in the dark red, attain their maximum intensity somewhere near the yellow part of the spectrum, and then diminish—finally becoming invisible at the violet end. It is supposed that the maximum of the energy curve is really in the ultra-violet; but, by reason of atmospheric filtration, the maximum of the energy distributed in the spectrum as it reaches us is in the neighbourhood of the orange and yellow.

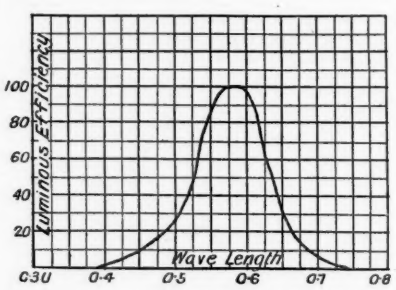



Fig. 2.—Curve of Luminous Efficiency of the Solar Spectrum.

By dividing the luminosity by the corresponding value of the energy throughout the spectrum, a curve of luminous efficiency is obtained, as plotted in fig. 2, which indicates that, for a given amount of energy reaching the eye, the greatest luminous effect produced is in the yellow. This result holds good at ordinary illuminations when the retinal "cones" of the eye are in action. When the illumination is reduced to the point at which the "rods" become the predominant organs, the distribution of luminosity is altered to the state of things shown by the dotted curve in fig. 1; and the blue and green are then the most useful portions of the spectrum.

Mr. Dow quoted, in a previous paper read before the Physical Society, M. Sartori's explanation of this physiological phenomenon. The retina contains two varieties of light-perceiving organs, known from their appearance as "rods" and "cones." The former seem to be sensitive to light, and more particularly to blue light, but cannot perceive colour—coloured lights appearing white. They are, moreover, sensitive to very weak light; but, as the illumination is increased, they become, as it were, saturated, and do not further respond. The "cones," on the other hand, perceive colour, but are most sensitive to yellow-green light. While they do not respond at low illuminations, they answer to increased stimulus long after the "rods" have ceased to act. The rods and cones are unequally distributed over the retina; the latter being predominant at the "yellow spot," or the central part of the retina.

Some interesting account is given of the effect of the "yellow spot." This is very much less sensitive to the violet end of the spectrum than is the rest of the retina. The result is that with a distant object, the image of which tends to fall upon the "spot," colours on the violet side are apt to fade from sight, through loss of luminosity, much more quickly than those on the red side. From this point of view, it would seem that for the illumination of objects to be seen at a distance—as, for instance, a clock face or shop sign—green and blue would be much less satisfactory than red light.

There is another and more important factor which enters into the problem—that of the chromatic aberration of the eye. On the reception of a cone of light through the pupil, the violet rays are separated out after refraction, and brought to focus in front, while the red rays focus behind the retina. Since sunlight and artificial illumination contain chiefly yellow light, the retina of the eye commonly adjusts itself to yellow light and assumes a position midway between these two points. When the eye is brought very close to a small luminous white object, it becomes easier to accommodate for violet than for red; and the white object is usually seen surrounded by a red fringe. But when the eye is removed to a distance of (say) 10 feet from the object, the state of things is reversed; the violet-blue fringe, however, being with difficulty seen in consequence of the low luminosity. This property of the eye has an important influence on its power of observing detail, and Mr. Dow sums up with the remark that the blue-green end of the spectrum appears to be somewhat advan-

tageous for very close work, but very bad for the illumination of objects to be distinguished at a distance.

Mr. Dow says that, on physiological grounds, one would suppose that the spectrum of our illuminants should be made as close to that of sunlight as possible. The eyes have for countless generations been adapted to the best use of sunlight; and it seems therefore possible that injurious results might follow the use of an excess of such coloured light as red or violet, which we are accustomed to receive in small quantity. There is, however, some difference of opinion as to how the physiological influence of different portions of the spectrum really differs. The dangerous influence of the ultra-violet light is admitted; and the violet rays may, to a less degree, come into the same class, as suggested by Dr. Seabrook in discussing Mr. Stickney's lecture (*ante*, p. 566). Mr. Dow further states that there is a general impression (with which he agrees) that red coloured light is in some way stimulating and irritating, while blue light is soothing. But he has been unable to find any scientific experiments supporting the theory. Dr. Steinmetz, in a paper recently delivered before the Illuminating Engineering Society, suggested that red rays were more trying to the eyes on account of the fact that, in the case of artificial illuminants, the energy (and therefore the heating effect) were greatest in this portion of the spectrum. The action is much less if green and blue rays are in evidence. Mr. Dow's experiments, however, failed to show any marked difference in the behaviour of the pupil orifice under the influence of red and green light. Apart from Mr. Dow's tests, it is interesting to note that Dr. Steinmetz three or four years back spoke of the harmful physiological effects of light, actually observed when working for a long time with artificial illumination, being due to the red and orange rays which predominate in the artificial illuminant; and he stated that the harmful effects disappeared on the exclusion of these rays.

It would seem generally that in artificial as in natura illumination excess should be avoided in the use of strong violet and red rays, which verge respectively on to either end of the spectrum. It is probable, indeed, although to a much less degree, that excess in any one colour is a mistake, if Dr. P. Fridenberg's opinion, as expressed some time back to the Illuminating Engineering Society, is correct. He remarked that if the eye is constantly exposed to one form of light in primary colours, one set of fibres, responding to that wave-length, is irritated; whereas in the case of white light, all the fibres are stimulated. Generally speaking, as Dr. Steinmetz once stated, people have become educated to require as close an approach to daylight as possible. The problem then is to find a light which gives spectrum-lines over the whole visible range distributed approximately in the same manner as the intensity of the solar spectrum, and giving as few lines as possible outside the visible spectrum.

The search, however, for an illuminant which will exactly agree with ideal diffused daylight may after all be an unnecessary one; and an approximation thereto—allowing for the economical use of the more luminous colours of the spectrum—may yet prove comparatively harmless.

## The London Gas Industry.

Following up the article on the accounts of the London Gas Companies which was reproduced in the "JOURNAL" a fortnight ago (p. 585), the "Joint Stock Companies' Journal" deals in the current issue with the statistics of the three London and five of the Suburban Companies (Brentford, Croydon, South Suburban, Tottenham, and West Ham) for the past half year, in comparison with the corresponding periods of 1905 and 1906. It is explained that the special design in making the analyses is to produce evidence of the variation of circumstances attending the operations of these Companies, and, in a degree, of all gas companies. Of these conditions, the most important of all is undoubtedly, as the writer remarks, "the growth in the consumption of gas by private users, and the maintenance of the quantity supplied for public lighting, &c.;" and the fact is emphasized that from this strongly progressive tendency have arisen "perceptible advantages to consumers and suppliers alike." The chief points brought out in the analyses are for the most part of a satisfactory nature. The expansion of sales, the reduction of manufacturing charges (apart from raw materials), the combination in regard to profits of enlarged totals with smaller averages per 1000 cubic feet of gas sold, the cheapening of administrative expenses on the latter basis, the greater productivity of residuals, and the reduction of the capital employed per 1000 cubic feet sold per annum, are all good features, mostly the effect of the increased sales. The "fly in the amber" is the heavier charge for raw material, principally coal, which it may be reasonably expected will cause a reduction of earnings in the immediate future. At the same time, the writer considers that there is the fullest reason to suppose that the multitude of people who have adopted gas lighting will continue to grow, to the benefit of the gas companies and their customers, who, as the consumption develops, "will gradually find that gas is a cheap and cheapening necessary of comfortable existence."

Mr. William Evans, J.P., of Kenilworth, one of the Directors of the South Staffordshire Water-Works Company, who died in July last, left estate of the gross value of £103,812.

## A NEW COMPARISON PHOTOMETER.

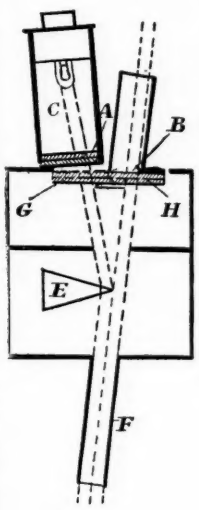
By Dr. CHARLES H. WILLIAMS.

**[A Paper read before the Illuminating Engineering Society at their Boston Meeting.]**

The object of this photometer is to provide a compact and portable instrument for measuring in foot-candles or other units the light reflected from surfaces, such as the walls of a room, the paper on a desk, &c., in order to determine whether one method of lighting is better than another, whether school-rooms are properly lighted, and to measure the light reflected from an illuminated surface as compared with a standard illumination.

The principle of the photometer is as follows: The object to be measured is looked at directly through a semicircular opening in the photometer. Through another similar opening the light from a small electric lamp attached to the photometer is brought by means of a prism in such a direction that the eye sees a disc of light, the right half of which comes from the object to be tested and the left half from the photometer lamp. If the intensity of the two halves is equal, it shows that the intensity of the illumination due to the object and the standard are equal. If they are unlike, the intensity is reduced on one side by means of a movable photographic film of gradually increasing density, until the two halves of the field are equal. The scale on the film gives the illumination due to the object as compared with the standard.

As will be seen by the accompanying illustration, the photometer is a small thin metal box, 3 inches square and 1 inch deep. At A and B are the two semicircular openings in the box. Over the opening A is a closed tube containing at its farther end a small tipless 5-volt lamp, and at the other end near the opening a piece of fine ground glass. E is the prism, and F the tube through which the light and object are seen. G and H are strips of glass, about 6 inches long by 1 inch wide, carrying the photographic films, which can be moved vertically before each opening, so that the light can be made more or less intense at will. On the handle supporting the box is a contact device, so that the thumb can light the photometer lamp when a measurement is to be made; the current being supplied by a small storage battery.




To use the instrument, it is first compared with some standard lamp placed at such a distance from a piece of rough white Bristol board that the surface of the board receives an illumination of 1 foot-candle. The photometer now has the photographic film before the opening H placed at zero, so that no light is absorbed by this film; and the other film before the opening G is moved up and down before the opening until both halves of the field, as seen in the tube F, are equal. The lamp of the photometer is then giving on the ground glass an illumination equal to 1 foot-candle of illumination as viewed by the photometer.

In order to measure the illumination of objects in the room, such as the light reflected from the walls, &c., we leave the film at G unchanged in position, and while looking at the object through the film H we move this film until the two halves of the field are again equal, and read off, from a scale attached to the film, its position, and from a calibrated chart we can then get the intensity of the illumination of the object looked at in foot-candles. If the object to be tested has an illumination of less than 1 foot-candle, we leave the film H at zero, move the film G to a position of less density until the field is equalized, and then read from the scale the position of the film to get the fractions of 1-foot candle of illumination.

After all the measurements are finished, we again test the photometer by comparing it with the original source of standard light—the film H being at zero. If we find the same position of the film G that was found in the first setting before the measurements were begun equalizes the two halves of the field, it proves that the comparison lamp of the photometer has not varied in its intensity, and this checks up the photometer both at the beginning and at the end of the measurements in a way that is not easily done with other instruments. With a storage battery of about 5 volts and a small tipless lamp of the same voltage, we get a light which is sufficiently steady for an ordinary test.

In all comparisons of daylight and artificial light, and with light reflected from different sources, we often get a troublesome difference in colour in the two halves of the field. This can, to some extent, be helped by placing a light blue glass in addition to the ground glass in the tube C before the comparison lamp. But it is surprising to see how quickly and with what small errors the setting of the films can be made to give an equalization of the two halves of the field, even with differences in colour; and this is helped somewhat by the fact that these photographic films are neutral and non-selective in their effect on colours.

# THE OXY-GAS LIGHT AND THE MANUFACTURE OF OXYGEN.

A paper describing the modern method for the manufacture of oxygen from the atmosphere and the use of the gas as an aid to the production of efficient lighting units from coal gas, read at the last meeting of the Austro-Hungarian Association of Gas and Water Engineers, was printed in a recent issue of "Gas-technik," the author being Herr Hansmann.

Herr Hansmann began his communication by sketching the earlier chemical methods for preparing oxygen in quantity, pointing out that they were not commercially successful, and that therefore illuminants like Drummond's lime light (which was invented in the year 1825) had never really become successful except for certain small and specialized purposes. When, however, the later experiments on the liquefaction of air showed that oxygen could be recovered in a state of purity by fractional distillation of the liquid, it became technically and economically possible to use oxygen in conjunction with coal gas for the general purposes of lighting.

At the present time oxygen is made in the following way: Air is freed from moisture and carbon dioxide and raised to a pressure of (say) 200 atmospheres. It is then caused to enter one of three coiled tubes of narrow bore which are surrounded by a common jacket. The tube in question soon increases in diameter, and communicates with a reducing valve which leads the air into collecting vessels, whence it passes backwards through the jacket already mentioned. The expansion of the air causes a reduction in its temperature, which is transmitted to the further quantities which are travelling through the coil. On repeating this process several times, the temperature of the air is continuously reduced until it finally reaches a point where liquefaction occurs. The liquid air next passes to a fractionating column, trickling down through a number of sieves or a thick layer of glass beads. In these circumstances, much of the nitrogen and a small quantity of the oxygen volatilize; the gaseous product being caused to encounter the liquid air on its entry into the column so as to evaporate more of the nitrogen and condense more of the oxygen. Hence the liquid which collects in the final receiver of the apparatus is fairly pure liquid oxygen. The liquid is allowed to evaporate once more, and is caused to pass through the inner tube of the coils, thus, like the cooled gaseous nitrogen, serving to remove part of the heat from the original compressed air. The apparatus in general is so constructed as to prevent access of heat to the utmost extent possible; but in spite of the most perfect insulation, so much heat enters it by conduction and radiation that fresh work has to be done upon the air in the form of compression throughout the whole process.

### The Oxy-Gas Light.

The first burner in which oxygen was successfully used in conjunction with a gas-flame with the object of evolving light was invented by Herr Nürnberg, of Berlin, in 1904. The essential feature of the apparatus was that the jacketing tube was provided with an elbow, so that the oxygen met with some resistance during its passage to the flame, was diverted from its original direction, and impinged upon the stream of gas at a sharp angle. This arrangement not only led to more perfect mixing of the gas, but also kept the flame away from that part of the burner which would otherwise suffer most from heat. The original burner has since been modified in a great many ways; but the crooked oxygen tube is still found indispensable. Nürnberg originally designed a common cock for the control of the two gases, having a plug with two holes and one single casing. The appliance had the defect of not being part of the burner, so that certain joints had to be made by brazing. Latterly, a more practical apparatus has been designed, which is arranged concentrically with the burner and fitted with a vertical plug. The last form of combined cock is easy to manufacture and more satisfactory to use.

The first "Nürnberg" burner developed light at the rate of one Hefner unit per 0·7 litre—*i.e.*, 36·8 candles per cubic foot when in good condition—but it has now been so far improved as to yield on an average 51·5 candles per cubic foot. In certain cases, indeed, its illuminating power has been equal to 73·5 candles per cubic foot, with a maximum value of 107. Nürnberg burners are now being manufactured in different sizes, and show the following illuminating powers and duties:—

| Size of Burner. | Illuminating Power. | Consumption in Cubic Feet. | |
|---|---|---|---|
| Mm. Inch. | Candles. | Coal Gas. | Oxygen. |
| 6 = 0·24 | 109 | 1·06 | 0·88 |
| 8 = 0·31 | 227 | 1·98 | 1·98 |
| 12 = 0·47 | 364–455 | 3·5–4·25 | 3·5–4·25 |
| 19 = 0·75 | 1090 | 8·85 | 8·85 |
| 28 = 1·10 | 1820 | 14·1 | 14·1 |
| 35 = 1·40 | 2730–3640 | 24 8–28·2 | 24·8–28·2 |

### The Cost of the Light.

Herr Hansmann next proceeded to deal with the cost of the oxy-gas or "Nürnberg" light in comparison with ordinary incandescent coal gas, on the assumption that one litre of gas burnt in conjunction with an equal volume of oxygen developed light at the rate of two Hefners per litre, and that the ordinary incandescent gas-burner afforded 100 Hefners per 140 litres, or 18·6 candle power per cubic foot. The speaker founded his calculations on the basis (translating his metric data into English figures) that 1060 cubic feet of coal gas could be made from 220 lbs. of coal by means of the heat evolved during the combustion of 35 lbs. of coke, a quantity which would generate sufficient energy to yield 281 cubic feet of oxygen in a factory of roughly equivalent capacity to the coal gas-works, which was supposed to be of "medium" size. As oxygen did not burn, but required an equal volume of coal gas to be used with it, it was necessary in calculating to add 281 cubic feet of coal gas to both sides of the equation; whence it appeared that (1060 + 281 =) 1341 cubic feet of coal gas consumed by itself in an ordinary incandescent burner would afford approximately 27,000 Hefners, whereas 281 feet of coal gas consumed with 281 feet of oxygen would afford 32,000 Hefners. It was also necessary to understand that the cost of generating oxygen decreased much more rapidly with every increase in the amount produced than did the cost of making coal gas; for while the amount of energy consumed in preparing oxygen from the atmosphere might fall from 4 to 1½ H.P. hours per cubic metre, as the operation was conducted on a larger scale, the quantity of coke used in carbonizing coal would only fall from 18 to 12 per cent. by weight of the coal consumed.

At the prices ruling in Austria, Herr Hansmann estimated that the actual working costs of producing oxygen were about 3s. 1d. per 1000 cubic feet; so that if an addition of 75 per cent. were made to them for depreciation, interest, &c., the total manufacturing costs might be said to be about 5s. 4d., which would allow the gas to be sold at about 7s. per 1000. If ordinary coal gas were sold at 4s. 9d. per 1000 cubic feet, the data already given showed that 100 Hefners could be developed in the Nürnberg burner for a cost of 0·125d., whereas a similar quantity of light produced by the Welsbach incandescent burner would cost 0·28d. The capital cost of erecting a factory for providing Nürnberg light over a district—*i.e.*, a combined coal gas and oxygen works—was naturally higher than that required in the construction of a simple coal gas-works; but the double main did not involve so great an additional outlay as might be thought. Indeed, the author stated that for a given number of lights the capital cost of a Nürnberg factory would be 1·2 units of money if the cost of a gas-works were one unit. The Nürnberg factory, too, would appeal to many consumers for whose purposes a supply of ordinary coal gas would not suffice, inasmuch as the supply both of gas and of oxygen would enable the autogenous soldering of metals to be carried out—a process that was constantly growing in importance.

## The Explosion of Gases.

The current number of "Nature" contains an interesting illustrated article on the above subject, signed by "L. B." The author points out that the earliest work on the explosion of gases was that of Sir Humphry Davy, who in 1817 published the results of the celebrated experiments on "the propagation of flame through small tubes and orifices" which led to the construction of the miner's safety-lamp. More than fifty years later, Bunsen devised the non-luminous gas-burner; observing that unless the flow of the mixture of coal gas and air exceeded a certain rate, the flame became unsteady and passed down the tube. In 1881, Berthelot and Vieille discovered that when an explosive mixture is ignited at the end of a long pipe, the velocity of the explosion rapidly increases from its point of origin until it reaches a maximum velocity, which remains constant however long the column of gas may be, and which greatly exceeds the speeds of combustion measured by Bunsen. This discovery was confirmed by the independent investigations of MM. Mallard and Le Chatelier. The velocity of the explosion wave constitutes a physical constant which has a specific value for each inflammable mixture; and measurements made by Berthelot and by Professor Harold B. Dixon have shown that it is approximately equal to the velocity of sound in the burning gases at the temperature of the explosion. For a mixture of hydrogen and oxygen in equivalent proportions, it is about 3000 yards a second. Le Chatelier's apparatus was not fast enough to analyze the wave of detonation itself. By apparatus devised by Professor Dixon, however, some interesting and important experiments have been carried out by him in conjunction with Mr. Bradshaw; and these and cognate matters are the subject of the article under notice.

In recent issues of "Stahl und Eisen," Herr H. Dicke discusses the use of water gas for welding purposes, and describes and illustrates the Dellwik-Fleischer plant for the generation of this gas. According to a notice of the articles in the Engineering Supplement to "The Times," the arrangement of the apparatus is shown by diagrams; and numerous examples are given of the welds carried out by means of water gas. Certain modifications in the process are explained, and the use of the gas for various industrial purposes and for the manufacture of steel are described. An account is also given of the value of the gas and of "blue" water gas for the production of power by gas-engines.

# WALES AND MONMOUTHSHIRE DISTRICT INSTITUTION OF GAS ENGINEERS AND MANAGERS.

## General Meeting at Shrewsbury.

THE paths of Gas Associations often lie in pleasant places; but they can seldom do so in a more pleasant one than did that of the Wales and Monmouthshire District Institution of Gas Engineers and Managers last week. To explain this, it is only necessary to say that the meeting took place at Shrewsbury, a town which possesses many features to interest those who visit it. Speaking as an ordinary visitor, one might hesitate whether to place first in this category the many charming old buildings to be seen, or the delightful views embracing the River Severn, which, of course, almost surrounds the town. For the gas engineer there is a third attraction which may, if the time at his disposal is limited, leave him little opportunity of judging of the others. This, it is almost needless to mention, is the new works erected by Messrs. R. Dempster and Sons, of Elland, for the Shrewsbury Gas Company in 1903, which readers will remember were fully described in the "JOURNAL" at the time. Like the town for whose needs in the matter of light, heat, and power they cater, the Gas Company have a history—and an excellent history it is. A progressive policy has met with the success which it deserves—and usually obtains; and in spite of the competition of electricity—if not actually because of it—the consumption of gas goes on steadily increasing in a most satisfactory manner. Hence it was that, some years back, the site on which the old works stand being "full up," the idea was adopted of putting up entirely new works on ground belonging to the Company a short distance away—a block of buildings, in fact, separates the two works. Except at the busiest season of the year, all the gas is now made at the new works, which, of course, are of quite an up-to-date character, and have been arranged with a view to extensions which will double the output, as soon as the demand necessitates them being carried out. It is not to be wondered at that both the Board and their Engineer, Mr. William Belton, are proud of these new works, seeing that the results attained have been even better than was anticipated when they were erected. Attentive as the Company are to the manufacturing side of the business, it may be pointed out that they are not less careful in regard to the sales department, for in the very heart of the town there is a show-room, where may be seen a varied selection of tasteful appliances for the utilization of gas. The offices themselves adjoin the old works; and it was in the Board-room there that the members of the Association met last Wednesday afternoon, and were received by Mr. Belton, on behalf of the Directors of the Company, none of whom unfortunately were able to be present. They had, however, left the matter in safe hands; for Mr. Belton's welcome was of the warmest, while he subsequently accompanied the members round the works and explained the various features to them. The inspection was preceded by the reading of a short descriptive paper by Mr. A. W. Elliott, the Assistant Manager, who also accompanied the party in their tour. As to the affairs of the Association, after a successful year of office, Mr. R. A. Browning, of Neath, vacated the chair in favour of Mr. Edward Jones, who has removed from Pontypridd to Burslem—a fact which led him at a later stage to suggest that the next meeting should be at Cardiff, to which proposal the members agreed. He also gave notice of motion that the Committee should consider the advisability of changing the date of the autumn meeting to the last week in September or the first in October—it having been pointed out to him that the present date is so near the holiday season as to be rather inconvenient to the members. Mr. Jones's principal duty in the chair, however, was the delivery of his Presidential Address, which was followed with the closest attention by those present, and, as Mr. Hubert Pooley remarked, gave the members ample matter for consideration. The *agenda* also included a paper by Mr. J. H. Canning, entitled "Some Notes on the New Electric Lamps." Mr. Canning, however, was not present, and so it was taken as read, and the discussion adjourned until the next meeting. This will give members plenty of opportunity to study what the author has to say; and the result should certainly be a good discussion. With the formal business, the address, and Mr. Elliott's paper, the time available for the meeting was fully occupied; and the inspection of the works and the subsequent entertainment of the members at meat tea, brought to a close a day which, it is quite safe to say, was thoroughly enjoyed by all those who were able to be present.

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The Half-Yearly Meeting of the Institution was held at the Gas Offices, Shrewsbury, last Wednesday; and the members were thus afforded an opportunity of inspecting the new works which were erected in 1903, and which were at the time fully described and illustrated in the "JOURNAL"—see the issues for July 7 and Dec. 15, 1903. At the beginning of the proceedings, the chair was occupied by Mr. R. A. BROWNING, Assoc.M.Inst.C.E., of Neath, the Retiring President. Subsequently, however, he gave place to Mr. EDWARD JONES, of Burslem, the President-Elect.

### A WELCOME TO SHREWSBURY.

The RETIRING PRESIDENT remarked that, before starting on the *agenda*, he must introduce to the members Mr. William Belton, the Engineer, Secretary, and Manager of the Shrewsbury Gas Company, who wished to say a few words.

Mr. BELTON said that, on behalf of his Directors, he had to express great regret that various circumstances had prevented the attendance of any of them there that day; but he had to offer the Association a very hearty welcome to Shrewsbury in their name. They trusted the members would have a most successful meeting, and would see in the gas-works something to please them. For himself, he was proud to have the pleasure of meeting those present; and, though it was not for him to boast, he thought the members would find they had at Shrewsbury a section of a new works as up-to-date as anything that was to be seen. These new works were giving splendid results—in fact, they had done even better than was anticipated when they were put down; and those connected with the Company had every reason to be satisfied with their arrangement and with the work accomplished. They reflected great credit on Messrs. R. Dempster and Sons, of Elland, who built the whole works complete, from end to end.

### MINUTES OF THE LAST MEETING.

The HON. SECRETARY (Mr. Octavius Thomas, of Pentre) then read the minutes of the meeting held at Neath in May last; and they were confirmed.

### NEW MEMBERS.

The following were elected members of the Association: Mr. Alfred E. Williams, of the Grangetown Gas-Works, Cardiff; Mr. James A. Boucher, of the Llynvi Valley Gas Company; Mr. Leonard G. Hall, of the Rhyl Gas-Works; Mr. W. E. Brock, of the Denbigh Gas-Works.

### INTRODUCTION OF THE NEW PRESIDENT.

The RETIRING PRESIDENT remarked that the next item on the *agenda* was a very pleasing one—the introduction of the President-Elect, Mr. Edward Jones. Of course, he said, Mr. Jones was so well known to them in South Wales that no words of his (Mr. Browning's) were necessary. They were very sorry to lose him from their district; but no doubt he had gone to a better place—for which all were on the look out. Mr. Jones came before them as a well-tried man. He belonged to the Council of the Gas Institution, and was a past-master in all things of that kind; and no doubt he would bring his experience to bear on his appointment as President of the Wales and Monmouthshire Institution in a way that would be of benefit to them. The affairs of the Institution would be safe in his hands; and therefore he was very pleased at his election. He would like to say, before he vacated the chair, that, whoever they had to fill the office of President, they were greatly indebted to Mr. Octavius Thomas, the Hon. Secretary. He, personally, could only say that he had experienced unusual kindness from him. Mr. Thomas was so attentive to every detail, that it left very little for the President to do. He was sure that every President on vacating the office would reiterate what he had said, and praise Mr. Thomas for his kindness and the way he carried out his duties. He concluded by wishing Mr. Jones a prosperous and happy year of office.

### THE RETIRING PRESIDENT THANKED.

The PRESIDENT then took the chair, and returned thanks for the kindly welcome given him as President-Elect, and now as President of the Association. The first duty he had to perform in the occupancy of the chair was, he said, a pleasing one—namely, to propose a hearty vote of thanks to the Retiring President. Mr. Browning, he thought they would remember, entered upon his duties as President of the Association with somewhat of a dubious air; but he seemed to get at once the zealousness and the earnestness of their first President, Alderman Thomas Canning—which he himself said he was going to copy. They all knew how hard he had worked for the Association during the past year, and how ably he had fulfilled the duties of his office. As to their Hon. Secretary, he (Mr. Jones) certainly endorsed every word that Mr. Browning had said. Mr. Thomas had been, and still was,

the moving spirit in the Association. The area covered by their Society was a wide one; and naturally, of course, it was difficult to get such attendances of members as they would like. Personally, he felt very much indebted to those who had come so far as Shrewsbury—though Shrewsbury was one of those towns with regard to which distance was a secondary consideration, in view of its natural beauty and historical interest. He had great pleasure in proposing a very hearty vote of thanks to Mr. Browning for the manner in which he had occupied the chair of the Association during the past year.

Mr. A. H. BROOKMAN (Tenby), in seconding, endorsed every word the President had said in Mr. Browning's favour.

The motion having been carried by acclamation,

Mr. BROWNING, in returning thanks, said that, as time was short, he would not inflict a long speech upon them. He considered that any man who accepted such an office should try to do his best.

## THE PRESIDENTIAL ADDRESS.

The PRESIDENT then read his Inaugural Address, in the course of which he said:

Gentlemen,—Allow me first to express my sincere gratitude for the high honour you have thought fit to confer in electing me President—a position which I felt somewhat diffident in accepting in view of my removal from the area of the Association. It was only my sense of loyalty, and the assurance of your forbearance, co-operation, and kindly expressions that induced me to accept; and I must confess that I feel the responsibility attached to the position—more especially in view of the fact that as a young Association much is required to maintain the high-water mark of my predecessors.

In the preparation of an address, I am sensible that I cannot say anything new or of extraordinary interest, in view of the multiplicity of gas and kindred technical institutions that, in the course of the year, are each called upon to hand down to posterity an introductory address. Light, heat, power, and residuals all have their rivals; and it behoves us to rise and work hand in hand to uphold and maintain the prestige that has been ours so long. Colliery proprietors and other bodies have their Associations, and meet their representatives in a body, in order to deal with labour questions—both rates and hours. Gas companies and authorities on the other hand have to meet individual attacks single-handed, although I admit that co-operation would be difficult, as no two works are exactly alike, and in the end a great deal would have to be left to the tact, judgment, and discretion of the individual. But admitting these difficulties, I contend that an Association with statistics and information as to its area would be invaluable, and one could draw from its stock on subjects relating to questions which come within its scope—not only regarding labour, but as to matters of commercial importance, such as the value of coals, the markets for coke and sulphate, and the many attacks made upon gas as a heating and lighting agent.

The Gas Institution and the District Gas Associations have undoubtedly been formed for dealing with the manufacture and distribution of gas, and not with commercial and labour questions. But the Manchester District Institution and other Gas Associations have made a success of their Commercial Sections; and if such a Board could be formed by us I feel sure the various organizations which have done good work would welcome debate of a general character rather than spasmodic attacks upon isolated places. I am satisfied if anything can be done in this respect, it would be unwise to prejudice the technical part which has done and is doing good work.

Looking at the expenditure account, we find the item which occupies usually the first column, "Coal and expenses thereon," one which has more or less agitated the minds of managers throughout the kingdom during the past year. With the prospects of better trade we are met with a corresponding advance in materials. Coal, the staple and root of our business, has been advanced 25 to 30 per cent., necessitating in many instances an advance in the price of gas. The coal question has pre-eminently occupied the first place at the annual meetings of gas authorities and companies; and no doubt every member has carefully noted the valuable expressions and opinions given at these times by such eminent men as Sir George Livesey and Mr. Corbet Woodall. It will be some little consolation to those who have sailed so close to the wind in their profits as to make it necessary to advance the price of gas; and while the sting is in we ought to take advantage of our position to increase our day-load by pushing the use of gas for cooking, heating, and motive power.

We shall await with some anxiety the proposed Eight-Hours Miners Bill, which is being pushed along vigorously, and which, if passed, will, it is alleged, increase the cost of getting coal, so that there is every prospect of yet dearer coal in the future. The gas industry, which has an annual consumption of 15 million tons, will feel the strain; but we must not forget that the general users of coal will also suffer, although as Sir George Livesey has pointed out the Eight-Hours Committee have advised Parliament not to neglect the interests of the great bulk of the people.

We have long accepted the truism that money is made or lost in the retort-house. Therefore an address could not be complete without a reference to this all-important question. My experience has thrown me in contact with various classes of fuel, and also various methods of manufacturing in different parts of the country; and I may be pardoned if I rehearse what perhaps you already know, and only await the opportunity to put in practice. We all acknowledge the splendid services of Sir George Livesey and his *confrères*, who have broken down the barriers of providing a high candle power gas; and in no part of the country is this more appreciated than in the area of our Association. While steam coal of world-wide reputation abounds in our midst, I venture to say the gas coal is not worthy of the name, compared with the qualities supplied in most parts of England. Consequently, our results, which are excellent from the material at hand, would be considered very inferior; and in this particular alone the benefit of our Association is of the utmost importance. In South Wales, I used to look upon 10,000 cubic feet of gas per ton of coal carbonized as an ideal; now I look upon 12,000 feet as a prospective yield, and an average rate per ton of 11,700 feet may be regarded as an approach to this. I have always supported high heats and long-duration charges; and my experience convinces me that if we are to cheapen our gas, we shall have to resort more towards coke-oven principles. With the advent of low-grade gas, the development and increase of incandescent lighting, and the demand for "Coalite" or its substitutes, I fail to see why we should consider the contentious question of unaccounted-for gas as being the all-important and ruling question in the management of our concerns. It is a problem that we have yet to solve.

Within a stone's throw of the Burslem Gas-Works, are chemical works carbonizing coal in inclined retorts, with no regard to the gas. They are working continuously, with a constant output of coke—thereby reducing the market value. The bye-products however are sufficiently remunerative to permit them to continue working with plant similar in all particulars (save gasholders) to that in use in our gas-works. The development of the bye-product coking industry and the low cost of production, as was shown in the valuable papers on the subject submitted to the last meeting of the Institution of Gas Engineers, lead me to anticipate that engineers will not allow this matter to rest, but will satisfy themselves that, with improvements in carbonizing, we may at least employ our surplus producing capacity to some monetary advantage.

The aim of every works is to sell gas at the lowest price; and this is best done where the capital is uniformly employed throughout the year. Though few of us are privileged to wipe out the old and begin *de novo*, still, with extending business, we can do much in looking forward and arranging to use methods which result in obtaining gas at the lowest cost per 1000 cubic feet. Never was our industry in greater need of the distribution of a low-cost gas than at present, and no manager can afford to neglect details, however small his works. It has not been my privilege to lay down any extensive new system, but rather to accept and extend; and during my last two appointments the works were practically new.

The general methods of carbonization before us now are: 1st, horizontal retorts, with hand labour; 2nd, horizontals, machine charged and hand-drawn; 3rd, horizontals, machine charged and drawn; 4th, inclined retorts, with machinery; 5th, vertical retorts, with machinery; and I may add a sixth or a go-between—the vertical and the inclined. The cost of carbonizing varies in each works with the local conditions, and is governed by materials and labour. But the difference in cost between hand-charging without machines and inclined retorts or machinery is such that no one can hesitate to accept the responsibility of advising machinery or the inclined system.

The Burslem retort-house is in three sections. The first has four beds of nine horizontal retorts, 20 feet through, with hand charging. The second has four beds of similar sixes. The third has five beds of eight inclined retorts, 20 feet long. As these beds work independently during the summer, I will give you the cost in each case per ton of coal and per 1000 cubic feet of gas made.

### *Horizontals, Full-Depth Regenerative Settings of Nine.*

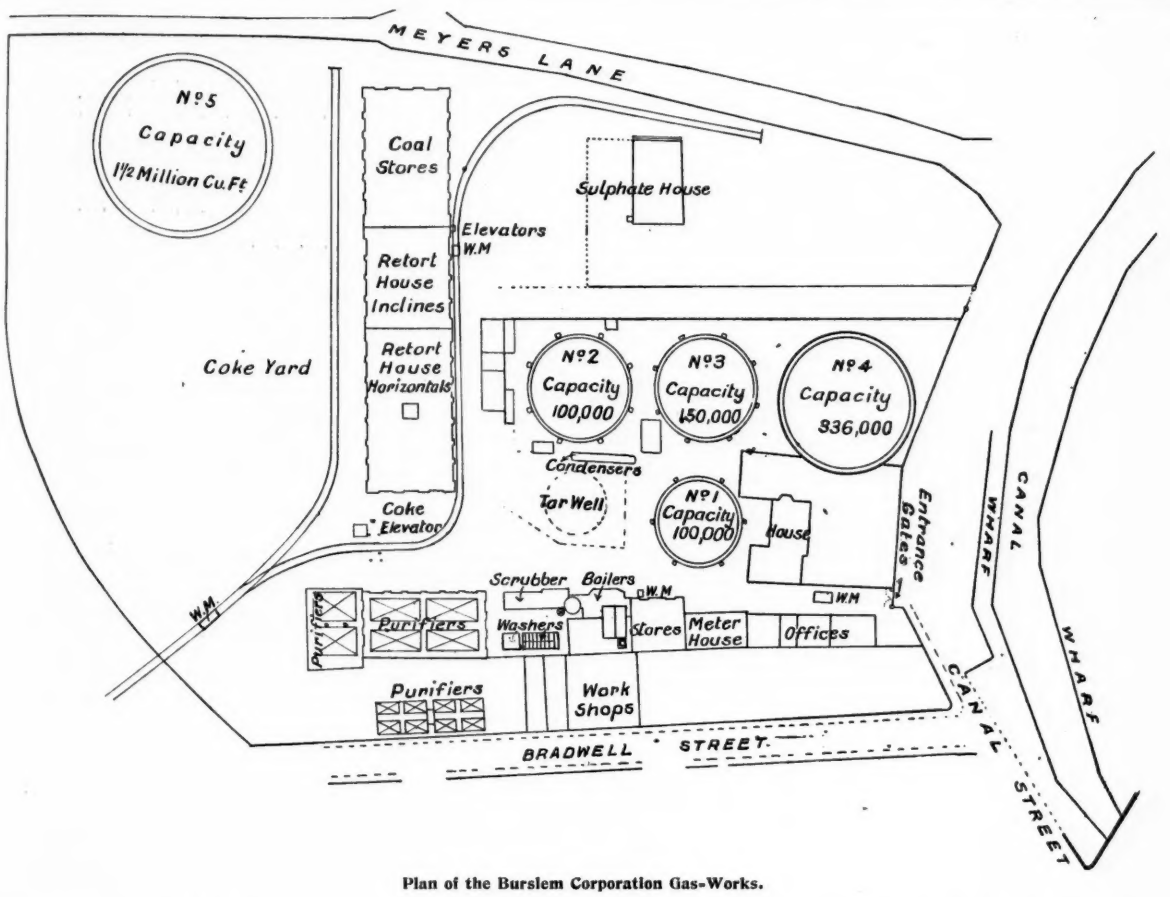
[Included in the cost of carbonization: Half foreman's wages, two-thirds exhauster man, leading stokers, stokers, cokers and coal wheelers, pipe-jumpers, &c. Time-and-half is paid for Sunday work.]

Retorts: Three beds of nines, 20 feet through = 27 retorts working
Number of charges, 1512. [six-hour charges.
Make of gas, 6,356,000 cubic feet.
Make per ton of coal carbonized, 11,814 cubic feet.
Make per retort, 16,816 cubic feet.
Coal carbonized, 538 tons.
Coal per retort per charge, 7·12 cwt.
Cost of carbonization, £84 1s 2d.
Do. per 1000, 3·18d.
Do. per ton of coal carbonized, 3s. 1·5d.
Men required for each shift—12 hours: 1 leading stoker, 5 stokers, 3 cokers and coal wheelers, 1 pipe-jumper.

### *Inclined Retorts with the Usual Machinery, Regenerative Settings of Eights.*

[Included in the cost of carbonization: Half foreman's wages, two-thirds exhauster man, leading stokers, stokers (charging), stokers (drawing side), coke wheelers, &c., elevator, and engine man. Time-and-half is paid for Sunday work.]

Retorts: Five beds of eights, 20 feet through = 40 retorts, working
Number of charges, 1880. [eight-hour charges.
Four days working on six-hour charges.
Ten days working on eight-hour charges.
Make of gas, 7,102,000 cubic feet.
Make of gas per ton of coal carbonized, 11,681 cubic feet.
Make of gas per retort, 12,682 cubic feet.
Coal carbonized, 608 tons.
Coal per charge, 6·47 cwt.
Cost of carbonization, £56 2s. 6d.
Do. per 1000 cubic feet, 1·9d.
Do. per ton of coal, 1s. 10·1d.




**Plan of the Burslem Corporation Gas-Works.**

The above cost includes all charges from the unloading of the coal from the trucks to the loading of coke into trucks. On eight-hour charges the men employed on each shift are: 1 leading stoker, 1 stoker (charging), 1 stoker (drawing), 1 coker, 2 elevator men, employed part time.

The conditions of working are identical in each case with respect to heats; and a hydraulic governor is placed upon each bench. The mode of working, though not new, may be of interest, as the make per ton at times tops 12,000 cubic feet without enrichment, and a good 15-candle power gas is supplied.

The plan shows the general construction. The coal siding is on the right side and the coke siding on the left. The inclined retort house has five settings of eights, 20 feet long. The coal is elevated to overhead bunkers over the retorts. The whole of the machinery, coal elevator, and conveyors are worked by a 12 H.P. gas-engine. The coke is deposited into large barrows and wheeled some 6 yards, slaked, and forked direct into the trucks, as will be readily seen by the plan. No coke conveyor is necessary.

The materials used are washed nuts and beans. Each retort holds 7½ to 8 cwt. Each bed has a separate hydraulic main, with the usual tar-main and flushing arrangement. There is also fixed to each a 2-inch main with a separate cock to fill with liquor from an overhead tank pumped from the well.

The method of working is: Before drawing the retorts, the hydraulic mains or boxes are filled with liquor, giving a 1-inch seal; and after the end of the charge the boxes emptied, and the whole of the contents returned to the well. Between the charges we work with a dry main. I have brought with me a diagram which shows the conditions at the exhaust and hydraulic main side of the governor.

I am repeatedly having inquiries relating to the working merits of these governors. My opinion is that they are essential in every retort-house; my only regret being that I did not instal them years ago. I should then have been spared a considerable amount of anxiety, especially when using dry mains. No matter how reliable the exhaust governor may be, there is always a risk; and the foreman in his anxiety to recover lost ground is often tempted to sacrifice the candle power of the gas for the make—a state of things the manager is not aware of until the hours of lighting are on. With the hydraulic governor, this is impossible; and no matter what the vagaries of the exhauster, steam, or aught else may be, the governor refuses to budge.

I find the best results are secured with a vacuum on the governor of 3 inches. The exhauster diagram shown may be considered erratic, and one can better imagine than describe the doubt and suspicions of the qualities of gas upon an examination of the chart in the morning, if this alone were used. The regularity of the exhaust line is in my opinion a remedy for stopped pipes with an increased make and a maintenance of a uniform candle power.

Just a word as to flushing. My experience at the Treforest Gas-Works convinced me of the absolute necessity of continuous flushing. The slightest neglect meant, not only stopped pipes, but blocked mains. I admit I worked high heats. But the class of coal demanded it; and though I continue to work high heats, the adoption of the flushing is the cure. The difficulty to face was the raising of the temperature in the liquor well, which was likely to, and did affect, my sulphate returns. I therefore diverted the liquor to a cooler, composed of a length of 12-inch pipes, and through two old boilers which are used as separators so as to prevent tar going to the sulphate stills. This was effective (the overflow or surplus only going to the well, while the bulk went forward to the sulphate plant, when working), and the temperature was reduced to 60° Fahr. So effective was this that our sulphate returns for the past year were 28½ lbs. per ton of coal carbonized—being an increase of 4 lbs. per ton.

As previously explained, I was called upon to extend and not to instal; but I may say that the cost per ton of coal carbonized with hand charging at the Burslem works is such that an extension of the inclined system has been decided upon; and I hope to put down further inclined retorts in the spring. Whether vertical retorts will show such superiority in obtaining better results at a decreased cost is not yet proved; but I am satisfied that retorts set nearer to the vertical than 32° (on the lines on which Mr. G. R. Love, of Guildford, is working) are likely to produce results nearer finality than at present. The Council of the Institution of Gas Engineers are not losing sight of the importance of carbonizing, and have appointed a Committee, with power to co-opt gentlemen whose results and labours really justify their opinion; and we shall await the report of their investigations with more than common interest.

It will be remembered that I contributed to this Association in 1905 some notes on the working of the Fiddes-Aldridge stoking machine as erected at the Treforest Gas-Works; and my concluding remarks were "that the machine had justified the claims for it, and with the complement of elevating and conveying machinery would compete forcibly, in cost per ton, with other methods of carbonizing." The use of machinery and the labour saved were not acceptable to the majority of the Pontypridd Gas Committee, and they refused to instal the overhead hoppers, coal-breakers, elevators, &c., without which no beneficial results could be expected. The machine has now been remodelled, and is giving satisfaction elsewhere, as will be seen from the account published by Mr. Edward Allen, M. Inst. C.E. So satisfied is he that additional machines are now being fixed. I mention this not that I hold a brief for this particular machine over and above others that are doing equally good work. Engineers have to choose the machine that is best suited for local conditions; and the simultaneous action of the Fiddes-Aldridge plant appealed to me as the nearest approach to finality. It exactly suited my requirements at Pontypridd; and if my present retort-house was suitable for, and the conditions were right, I would not hesitate

to adopt machinery. Even a moderate sized works (say) of 50 millions, would be well-advised to consider the adoption of machinery, not only from a humanitarian point of view (to do away with the arduous task of stoking), but from a business point. Surely no one can accuse us wrongfully in cheapening the cost of production.

Before I leave the retort-house, I cannot refrain from associating naphthalene troubles with carbonization; and though it is a long cry from the ascension pipe to the distributing main, yet I have invariably found that troubles with stopped mains and pipes in the retort-house give immediate anxiety with naphthalene deposits in the outside district. A keener and more concentrated watch on the gas in its earlier stages might lead to less trouble, and ultimately avoid the very many devices that exist to prevent its appearance in the mains and services. Burslem has, with others, suffered severely in the past; and I expressed myself to the Gas Committee there as thankful in anticipation for the fact that a plant to prevent and overcome naphthalene deposits had been fixed. It is the Hastings carburation process, invented by Mr. C. E. Botley, the Engineer of the Hastings Gas Company. I have nothing but the highest praise for it—not having had a single complaint of naphthalene this year. Last year, about this period, being holiday time, I took advantage of the opportunity to strip the engine. Unfortunately, we had a sudden snap of cold; and I had some fifty complaints. I immediately got the plant to work, and have not had a single complaint since.

The process consists essentially in adding to the moving gas, on its way to the points of combustion, an exceedingly fine mist or fog produced from petroleum by means of specially designed atomizers. The carburator is merely a steel cylinder, fitted with the necessary connections, drip-wells, &c. Atomizers and sight-holes are fixed on the outlet of the governor of the town. The compressor is a 4 H.P. steam-engine, and it maintains a pressure of 70 lbs. to 80 lbs. per square inch on the compressor gauge, and 25 lbs. to 30 lbs. on the oil-cylinder gauge. The atomizers are used in accordance with the amount of gas passing through; and when at work the operation (as viewed from the sight-holes) is that the oil-jets are lost and the whole mass is a mist or fog. The amount of oil used for the year to March 31 last was 420 gallons; and the cost per 1000 cubic feet of gas sold was 0·017d.

Purification in closed vessels has not yet realized the ideal we have long anticipated and worked for, so that sulphur can be removed from the gas and, if possible, sold much in the same way as ammonia. If this is not accomplished as perfectly as we would like, engineering, new methods of working, and legislation have not been idle in other directions; and those who have been called upon to extend or renew works have realized the beneficial results both in construction and operating economies. In this connection, one must not forget the luteless purifying system introduced by Mr. Green, of Preston, with its resulting reduction of capital cost.

I do not intend taking up your time with any description of even the various improvements that have been introduced from time to time, but would like to record a little experience which may perhaps be helpful to some in the working of purifiers. The luteless purifiers admit of economies in many directions—notably in space occupied, and in reduction of lifting gear. These are items which tend to reduce the capital charges to a minimum and cheapen the cost of gas per 1000 cubic feet purified. In dispensing with roofs over the purifiers, it must be clearly understood that it is a mistake to economize by neglecting to roof the revivifying area. This is essential for the proper working of oxide, as success depends largely upon the proper preparation of the material. If exposed to the wet and containing an excess of water, purification is retarded; if in deep layers, it short-circuits—giving back-pressure which finally results in the box being thrown off and emptied before the oxide is half spent. I have had disappointments in this direction which makes the subject one of interest to me. I am aware that each engineer works his purifiers according to his ideas of what is most suitable to his particular works; and it is only by failures we are ever able to judge our successes.

It may be interesting perhaps to describe the mode of working which, in my opinion, is the most successful, having regard to cost per 1000 cubic feet and purity of gas at Burslem. The plan of purifiers is before you. Nos. 1, 2, 5, 6, 7, 8, are worked with oxide. Nos. 3 and 4 are worked alternately with lime as required. Nos. 1 and 2 (erected last year) are 35 feet by 22 feet, and hold 70 tons of oxide each. They are luteless, and are worked as shown with a travelling runaway, and buckets for charging or discharging, containing 10 cwt. each. No. 3 is charged with oxide (60 tons), which will be fully spent when taken out. No. 4 is lime. Nos. 5, 6, 7, and 8 are used as catch-boxes. The sulphur compounds are kept well within the parliamentary limit.

It may be of interest to relate the circumstances which led to the adoption of this method of working. We were accustomed to work up our oxide for sale in the first boxes, using new oxide (or that containing a low percentage of sulphur) in the last four boxes, for the purpose for removing the last traces of sulphuretted hydrogen. This procedure is dictated by the law of mass-action; but my experience has been such as to show that there are other circumstances which modify very considerably the results one would expect to obtain. The observations which I have made for some time in this connection will be well illustrated by quoting the following particular case: We charged the first box in the series with oxide partically spent, on Nov. 21, 1906. The following is the result of analysis of an average sample at the time:—

| | |
|---|---|
| Percentage of sulphur on the dry basis | 30·10 |
| ,, ,, ,, wet ,, | 26·63 |
| ,, ,, moisture | 11·50 |

This box was next changed on Jan. 21, 1907, and the amount of gas passed through during this period was 62 million cubic feet. The analysis of the oxide when taken out was surprising—

| | |
|---|---|
| Percentage of sulphur on the dry basis | 43·40 |
| ,, ,, ,, wet ,, | 29·80 |
| ,, ,, moisture | 31·30 |

You will observe that although, in the bulk, the sulphur had increased by 13·3 per cent., the percentage of increase on the wet basis was only 3·17; and this after having passed 62 million cubic feet of gas through it, contained from 500 to 600 grains of sulphuretted hydrogen per 100 cubic feet. It was then apparent to me that I should be seriously hampered both in working up the oxide for disposal and in effective purification, because to have followed out the practice of working the oxide from the last of the series successively through the series back to the first would have meant that I should have had on hand a large mass of material containing such a quantity of sulphur as to reduce its efficiency in the boxes, while not containing such a percentage of sulphur on the wet basis as would enable me to dispose of it to advantage.

The analyses of the oxide put in and taken out of the boxes gave me the key to the solution. I observed that while the percentage of moisture of the oxide in the first two boxes was always increased, the moisture in the oxide after passing through No. 3 box was always decreased. It was now evident where the secret lay. The first two boxes are in the open, and all the others are under cover. Naturally, the outside boxes are readily influenced by changes in atmospheric temperature. It should be noted that in the example I quoted, the purifier was working in the cold season of the year; and, as a consequence, a great deal of the moisture was condensed there. The gas robbed of moisture in the first two boxes, passes into the third box, which is under cover and is not subject to the same reduction of temperature as the outside boxes; and it is well known that chemical reaction takes place more readily at a temperature approximating to 60° Fahr. than at a lower temperature. This was the case. Accelerated reaction was, of course, responsible for a further increase in the temperature; and under these circumstances—the reverse of the conditions in the first boxes—evaporation took place. I then resolved to make No. 3 the finishing box, and with what success you will see from the following tests:—

*Analysis of Oxide when put in No. 3 Box on Nov. 10, 1906.*

| | |
|---|---|
| Percentage of sulphur on the dry basis | 43·4 |
| ,, ,, ,, wet ,, | 29·8 |
| ,, moisture | 31·3 |

This was the oxide which was taken from No. 1 box. The figures are most interesting because it cannot be said that the physical character of the oxide was the cause of the different results as might have been said if different lots of oxide had been used. The oxide when taken out, tested—

| | |
|---|---|
| Moisture | 6·97 per cent. |
| Sulphur on the wet basis | 53·00 ,, |
| ,, dry ,, | 57·00 ,, |

The percentage taken up in the bulk—that is, on the dry basis—was 13·4 per cent.; while on the wet basis the percentage of increase was 23·2, due of course to the reduction in the amount of moisture.

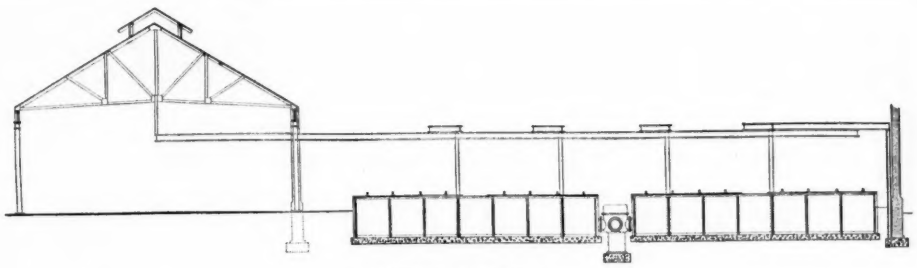
I have at the time of writing had the oxide tested which is at present in No. 1 box; and I append the result of the test—

| | |
|---|---|
| Moisture | 29·06 per cent. |
| Sulphur on the dry basis | 57·00 ,, |
| ,, wet ,, | 40·40 ,, |

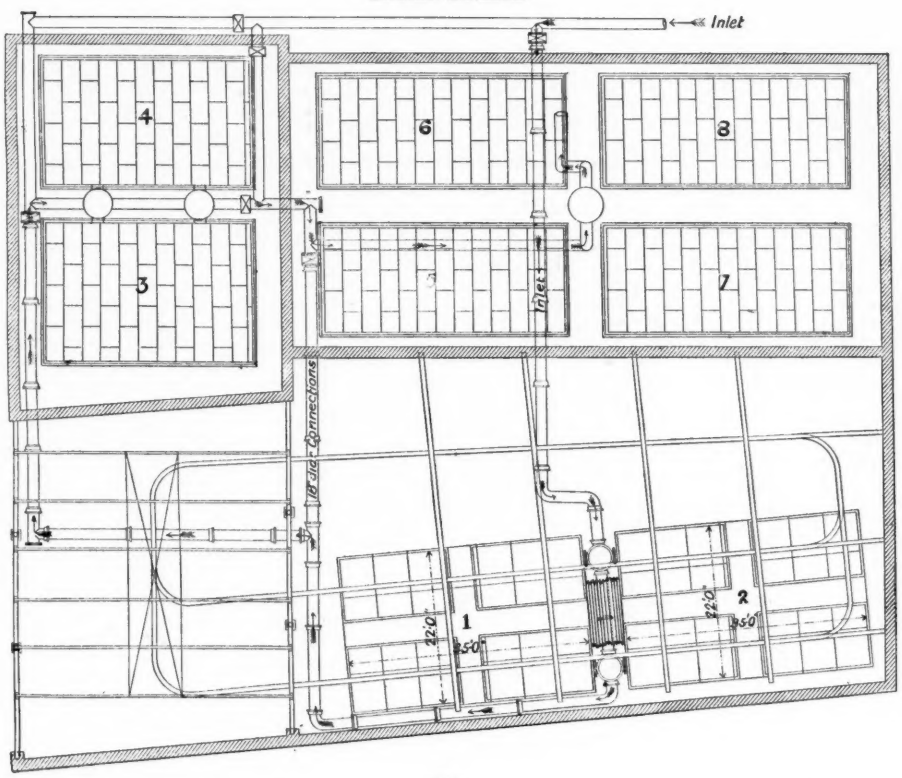
Unless the percentage of moisture be decreased, it will be necessary to work the oxide until it contains 72 per cent. on the dry basis, as the buyers will not take it unless it tests 50 per cent. of sulphur on the wet basis. The difficulty will be overcome by finishing, as previously mentioned, in No. 3 box. Daily tests on all the purifiers are made with the Wanklyn bottle for sulphuretted hydrogen and the states of the purifiers are as below—

| | $SH_2$ per 100 C. Ft. | Gas passed Mills. Pressures. |
|---|---|---|
| Inlet of No. 1 Box | 520 grains | |
| Outlet of No. 1 ,, | 260 ,, | 105 |
| ,, No. 2 ,, | 50 ,, | 96 |
| ,, No. 3 ,, | Tinge (= less than 1 gr. per 100 c. ft) | 85 |
| ,, No. 4 ,, | Very faint tinge | 44 |
| ,, No. 5 ,, | Clean. | |
| ,, No. 6 ,, | Off. | |
| ,, No. 7 ,, | Clean | 109 |
| ,, No. 8 ,, | Clean | 114 |

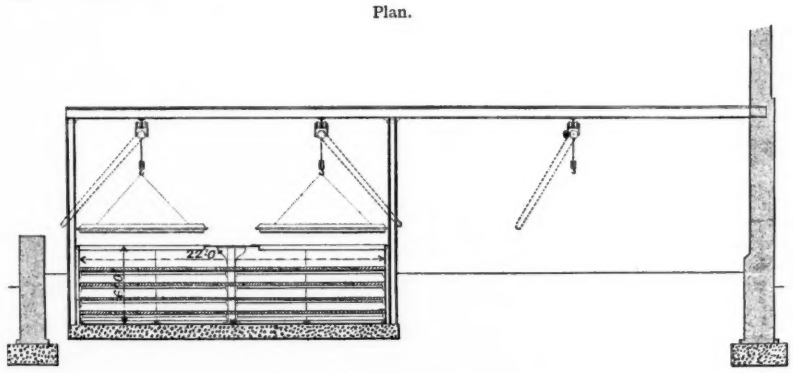
The grids which I use (C. & W. Walker's make) I find act exceedingly well—being simple, inexpensive, and allowing the full depth for oxide being used. The grids are all put in position before commencing to refill, and the box is filled up to the top. About 1 per cent. of air is drawn in at the inlet of the exhauster through a mercurial governor fixed to a 100-light dry meter, the register of which is taken with the station meter, and the gases tested both for lighting and for calorific power. The Carpenter



Sectional Elevation.




Plan.




Cross Section.

**Burslem Corporation Purifier Extensions.**

standard burner is used for the photometer and a Simmance-Abady calorimeter.

At Pontypridd I had a very rough experience with the 18-inch inlet to the gasholder being blocked with water to the level of the canal. The defect was a bad joint on the tube inside the tank; and as the tank had to be emptied before it could be repaired, a third lift was added to the holder. Fortunately, a 10-inch valve had been fixed, and acted as a byepass. The moral to this is, in erecting gasholders, always to have a byepass.

Burslem is credited with the largest spiral-guided gasholder in the Midlands; and in consequence I am often asked for an opinion. I fully endorse and agree with the retiring President, and can say with him that my anxiety is not with the spiral-guided but with the column-guided holder; and in the event of gales, to which we are very much exposed, the column-guided holders are thrown out of action. The spiral is perfectly rigid and steady, standing out of the ground 120 feet when full, with a capacity of 1½ millions.

While speaking of gasholders, painting as you are aware is a serious item—especially in the vicinity of iron-works, pot-banks, and districts such as ours; and I should be remiss in not bearing testimony to the many labour-saving devices introduced by my predecessor, Mr. Henry Peaty, among which was painting and whitewashing by compressed air. Pipes are laid throughout the works, and the handrailing round the holders is used as air-tubing. The whole of the painting of the gasholders, tanks, purifiers, &c., is done with the machine—not a brush being used. It is both economical and efficient. The retort and purifying houses, workshops, cellars, &c., are also limewashed each year by the same process. The compressor engine is 12 H.P., giving a pressure of 40 lbs. to the square inch at the compressor, and 25 lbs. at the machine.

Whatever may be the future of the coal consumer, there is strong evidence that gaseous firing for domestic and commercial purposes will occupy a very important position in the near future; and it behoves us to work steadily with the view of adopting such means, and exercising such care and attention, as will give results that will practically place coal gas in the forefront for usefulness, economy, and hygiene. I cannot refrain from adding my testimony to the valuable experiments that Mr. Brearley made with gas-fires, as described in his paper before the Institution of Gas Engineers at their June meeting this year. For some time I have

been experimenting upon gas-fires, to make them applicable not only to the drawing-room but to the sitting-room of the artizan. Continuing such experiments, I am satisfied that radiant heat in the simplest form, with a regulated and governed amount of gas, gives the best results. Last year I introduced the hire purchase system of gas-fires—eight quarterly rents covering the net cost of the stove. Gas-fires where purchased are charged at cost price for the stove alone, and fixed free. One point I conclusively settled is that we do not recommend stoves with hot-air chambers, finding as I do that the dust accumulates on the inside, and when lighted gives off fumes, which in rooms used intermittently are very offensive and lead to the condemnation and a restriction in the use of flueless stoves.

Cooking stoves are now so common that it seems superfluous to advise. But there are still hesitations, especially in the colliery districts, to adopt the principle of "easy terms" which is being introduced into every business; and if we wish to keep ahead, we must never allow sentiment to stifle our best endeavours. The subject is always an interesting one; and for success in pushing the gas supply to heating and cooking, I consider it is important to: 1. Advertise and give facilities for demonstrating with a show-room. 2. To be in a position to lay on gas and to fit up houses, cookers, or heaters on "easy terms." 3. To educate consumers in lighting, heating, and all purposes where gas can be used.

Advertising and canvassing are essential; and when we read of and see the enormous outlay by well-known caterers for the comfort and health of the public, we must be convinced that there must be something substantial made out of judicious advertising. Not a season therefore ought to go by without the public being canvassed and advised as to the possibilities of gas, and no opportunities should be lost of seeing them personally. Pamphlets, post-cards, and forms should be freely distributed. The fitters and inspectors should always have in their possession post-cards with the fullest possible particulars on, to distribute wherever opportunity presents. But by far the most practical means of advertising is the show-room; and I cannot better illustrate this than by asking you not to return home without viewing the Shrewsbury Gas Company's show-rooms, under the management of our worthy host, Mr. Belton, which to my mind is undoubtedly the best equipped and most tastefully laid out I have ever seen. It is pleasing and attractive, and every provision is made for showing to the best advantage the various stoves, cookers, appliances, and latest designs in lighting.

The introduction of the slot meter has revolutionized the supply of gas, and has placed it within reach of the humblest. I have strongly advocated for years the slot installation system, whereby applicants (with the consent of the landlord) can have four burners with incandescent fittings and a cooking-stove fixed; the number of feet of gas given per penny being such as to allow 10d. beyond the net price of gas charged to ordinary consumers. The surplus amount is carried to an account created for this particular department.

It may be said that, in colliery districts, cookers are not wanted (and the slot meter system without them is not worth its expense); but this was not my experience at Pontypridd. During the last five years, 2000 stoves were fixed, and the revenue warranted the outlay; for even where the collier gets his coal at cost price, and banks-up his fire for the night, the facility of the cooker is too tempting to resist its use. I have instituted the system in Burslem; and it promises to be the success anticipated.

The education of the consumer in all the phases of gas, has now become a fine art. Many methods are adopted, and we have many wrinkles to learn from our American brethren in this art. It behoves every manager to make such preparations as will give his customers all needful information whether it be as to lighting, cooking, heating, gas-engines, or gas for commercial purposes. Competition, too, behoves us watch that our interests do not go by default; and much business can be obtained, and much retained, where a manager is in a position to educate and, if necessary, demonstrate the true advantages of the latest methods of gas consumption. The rapid strides of incandescent lighting have outwitted our friends the electricians; and our position to-day is stronger in competition than at any other period of its history.

The electric lighting works at Burslem belong to the Corporation; and while the most friendly rivalry exists, the gas and electrical departments are keen with respect to business. I have been called upon recently to show to the best advantage both public and private lighting; my Committee deciding last month to do away with all flat-flame burners in the public lamps and instal incandescent lighting throughout the borough. The lamps used in the centre of the town are high-pressure ones, with three 300 candle-power burners in each lamp on the Keith and Blackman system. But progress in this direction has been stopped by the erection of electric arc lamps, in order to encourage the Electric Committee. Among many installations of high-pressure gas-lighting is that at Messrs. Doulton's works. They have a high-pressure installation in their new works—120 lights from a 400-light meter in conjunction with a belt-driven motor working up to 30 inches pressure. It is so satisfactory that it is being extended to the old works.

Churches and halls have been a speciality with us; and recently the "Staffordshire Sentinel" published the following paragraph which may be of interest:—

WESLEYAN CHURCH, BURSLEM.

For a considerable period, great dissatisfaction has existed among the worshippers of the commodious and handsome edifice regarding the artificial lighting arrangements; and a short time ago, after a prolonged discussion, it was decided to await the introduction of the electric light into the town before finally deciding as to improvements. A strong feeling existed in favour of the newer light; but the advocates of the older system declared in favour of gas. Formerly the church had 93 burners in two "sunlight" clusters. These have now been superseded by two gasaliers, each of sixteen Welsbach burners of 2400 candle power, so suspended that the whole arrangement can be dropped to the floor in a few minutes. Under the gallery are ten patent arc lamps with inverted burners, each giving 180 candle power. These cluster lights are enclosed in large opal globes with steel-bronze fittings. The orchestra is illuminated by Westminster burners, with pneumatic switches. While the total cost of the installation is not one-third of the estimate for the electric light, another important factor claimed by the promoters is that the ventilation has been improved. General praise is heard on all sides as to the satisfactory manner the Fittings Department of the Burslem Corporation Gas-Works has completed the work. The total lighting power inside the building is equal to 4740 candles; and the gross consumption per service will not exceed 600 cubic feet of gas. The general appearance on Sunday evening was most delightful. The sacred edifice was flooded with a soft white light; and the general effect was brilliant. The cluster lights, which are fitted with a separate bye-pass, are under control, and as simple as the electric switch.

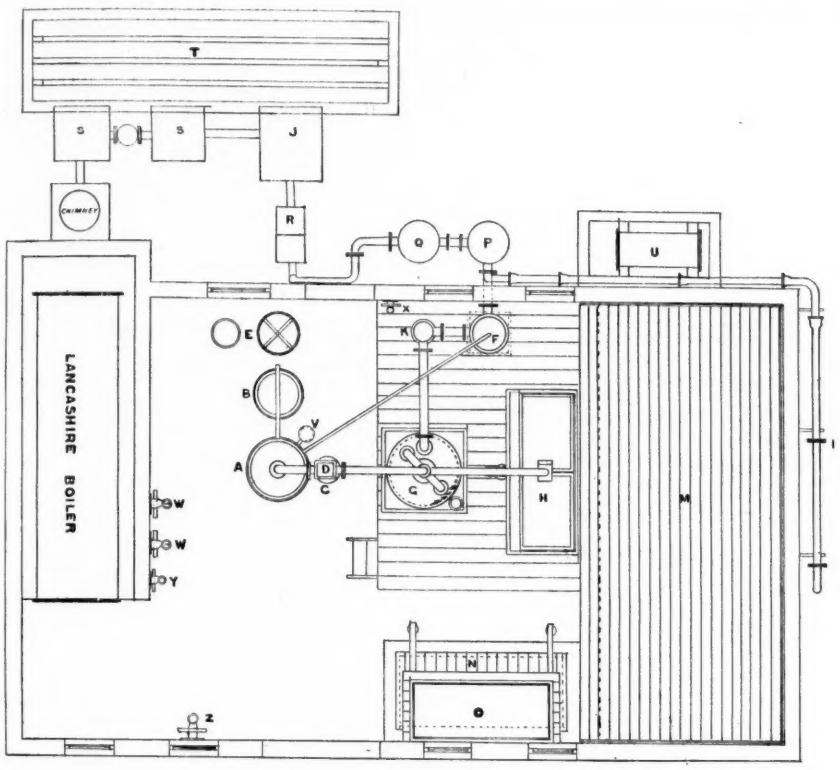
The inverted light has become very popular, and has removed much of the stigma that existed with respect to the want of artistic design which clung to the old chandelier. I have been able to adapt, with great success, the inverted lamp to the work benches and decorators' tables in the china factories in our district; the enamel reflectors and the flexible tubes being especially adapted to this class of work.

There is no question so vital in colliery districts as the disturbance of mains; and much anxiety is caused by subsidences entailing a high percentage of unaccounted-for gas. After severe tests and experiments, I have conclusively proved—at least to my own satisfaction—the advantages of the steel tube as being less liable to breakage, and, with the special joint, less liable to leakage in the event of subsidence. I have just laid over a mile of steel mains; and, in places of extreme danger, I would recommend the long joint as a preventer of accident. Steel mains have many advantages. They are bent *in situ* to the required shape; and, when set up with lead wool, a strong job results, capable of standing a strain of 25 to 30 lbs. to the square inch.

Much has been said of late, and a great deal of useful information has been given by our American friends, on the question of high-pressure distribution. We have not perhaps the opportunities of laying out new districts, but few of us will disagree with the importance of maintaining a pressure consistent with all the requirements of modern needs, whatever that pressure may be. In my opinion, the pressure should at no time of the 24 hours be below 20-10ths in any part of the district. Consumers should have at all times and for all requirements an adequate, and as far as possible a uniform pressure, to enable them to take the fullest advantage of the gas. The fact that high pressure is synonymous with high leakage is not a question that concerns the consumers, but the management; and it does not reflect much credit to allow our mains and services to be laid, or to remain in such a state that will not permit of a pressure equal to the requirements of the district. In the question of leakage, it is not always the mains that cause the trouble, but more often the services; and too much attention cannot be paid to this. A slight initial first cost amply repays. Our services are steam strength; and in made or unsuitable ground they are laid in wood-channel troughing filled in with cement.

As there is much trouble at times with the waste gases and effluent from sulphate plants, I would say a word as to the method adopted by us, and which is highly recommended by the Alkali Inspectors. The plant employed is capable of producing 3 tons of sulphate per diem. In general, it is of the usual design. The arrangement of the apparatus of the plant will be seen from the plan. The closed form of the saturator in operation I have found to be both economical and effective. The man needs only to obtain a proper adjustment of his taps, when no further attention is required beyond the removal of the sulphate from the draining table to the store. The process employed for the treatment of the saturator gases is the combustion-neutralization process. Briefly it is this: The gases leaving the superheater are passed successively through a tubular condenser, an ordinary water cooler, a pipe condenser, and a scrubber. The gases then pass into a coke furnace, where the sulphuretted hydrogen is burned, and the products of combustion pass from the furnace into a brickwork tower of rectangular section, filled with chequer brickwork, and finally through two other brickwork towers which are filled with limestone, and then into the chimney stack. Down the chequer brickwork tower, the effluent liquor from the still is caused to pass; and in passing it absorbs some portion of the sulphur dioxide contained in the gases. Water is pumped to the top of the limestone neutralizing tower, and is evenly distributed over each tower through ordinary rose-sprays. The water passes into the towers through holes in an earthenware top which have a water seal. The water percolates over and between the pieces of limestone, and thus presents a large surface for the absorption of the sulphur dioxide. The gases are made to travel upwards—that is in the opposite direction to the water. The acid gases absorbed are neutralized by chemical reaction with the limestone.

When the plant was installed, it was in the experimental stage; so that some little difficulty was encountered in meeting all the Government regulations with respect to the acidity of the exit

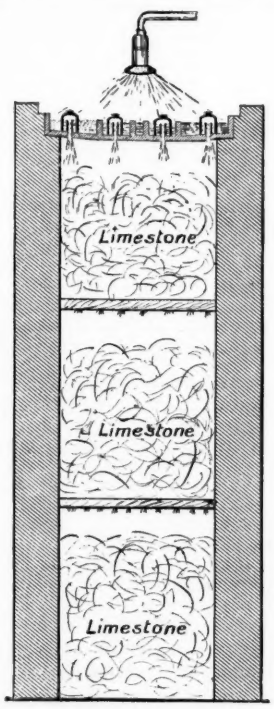



REFERENCES.

A. Large still.
B. Small still.
C. Spent liquor valve.
D. Cast-iron catch-box.
E. Liming arrangement.
F. Heater.
G. Saturator.
H. Draining table.
I. Condenser.
J. Chequer brickwork tower.
K. Lead catch-box.
L. Mother liquor well.
M. Sulphate store.
N. Acid store tank.
O. Acid supply tank.
P. Condenser.
Q. Scrubber.
R. Furnace.
S. Neutralizing towers.
T. Settling tank.
U. Devil-water tank.
V. Pressure box.
W. Liquor pumps.
X. Devil-water pump.
Y. Boiler-feed pump.
Z. Water pump.

**Sulphate of Ammonia Plant at the Burslem Corporation Gas-Works.**

gases. The maximum amount of sulphurous acid allowed in the exit gases is 4 grains per cubic foot, and sulphuretted hydrogen has to be entirely absent. The condensing portion of the plant was found to be insufficient. The gases being charged with water vapour could not be properly burned; and consequently sulphuretted hydrogen passed into the stack. The water distribution on the towers was also defective. The latter was a simple matter to set right, and the former was overcome by installing




**The Neutralizing Tower of the Sulphate Plant at Burslem.**

140 feet of 6-inch cast-iron pipes cooled by a water spray. The report of the Inspector of Alkali Works for the year 1906 said:

Since the apparatus has had the advantage of the chemical supervision suggested, better working has resulted. This has been so since the erection of the additional condensers; for those originally put down were found insufficient when the still was worked at full pressure. The gases entering the furnace were, therefore, not dried sufficiently, with the result that sulphuretted hydrogen passed the fire unburnt, and so was found escaping the final tower in the chimney. The alteration referred to consists of 140 feet of 6-inch cast-iron pipes water-cooled, placed between the saturator and the original condensers. By the more complete drying of the saturator gases before reaching the furnace, the difficulty has been overcome. The average total acidity of the gases leaving the furnace, and passing into the towers for the year is 19·3 grains as $SO_3$ per cubic foot. The average total acidity of the gases leaving the limestone tower and escaping into the chimney is 0·4 grain as $SO_3$ per cubic foot.

You will observe that we are well within the Government limit. The chief advantage of this method of treatment over that of oxide purification is the reduced labour costs. But where the works are not of sufficient magnitude to afford chemical supervision I would not recommend its adoption, as it does not lend itself to rule-of-thumb working. Since the recent introduction of the use of oxide in heaps, where one heap can be revivified *in situ* while the other is in use, and *vice versâ*, the margin of difference in working costs between the two cannot be so very great; but the neutralizing process would be of service to those who are under restrictions as to effluent liquor. Some authorities will not admit an alkaline or an acid effluent; but by the use of the neutralizing plant, one can acidify the alkaline effluent from the stills with the effluent from the towers, and then render it neutral by passing over limestone.

In bringing my address to a close, I would like to express on behalf of the Association our warmest thanks to the Directors of the Shrewsbury Gas Company, for their kindly welcome to the old historical town which delights both the antiquarian and the lover of Nature, and (what is the utmost importance to us) a well-equipped and up-to-date works, a model show room, and all that accounts for progress and efficiency; and we join heartily in congratulations to our host, Mr. Belton, on the attainment of his 28½ years of unique successful management. The times seem to demand that applicants shall not be eligible when experience is approaching its best; but in view of our present visit and that most interesting event on our visit to Swansea a year ago—when Mr. Thornton Andrews attained his fiftieth year of management—who shall say that the wisdom of the Authorities is sound, "Too old at forty."

Mr. BROWNING, who proposed a hearty vote of thanks to the President, remarked that they could not, on hearing it read, at once grasp all the details in so long an address; but when they saw it in print, they would all be able to add something to their store of experience.

Mr. HUBERT POOLEY (Stafford), who seconded the proposal, remarked that it had afforded him much pleasure to accept the invitation to be present at the meeting—especially as it included a visit to the works of the Shrewsbury Gas Company, which he had not seen previously. He was sure they would all feel very grateful to Mr. Belton for his permission to inspect the works. With regard to the difficulties of preparing an address after so many had been given, he was in a position to sympathize with the President, as he had recently been through a similar experience

But he must certainly congratulate him on the result of his efforts. He had given them ample matter for consideration, and they would peruse the address with very great interest when it appeared in print.

The vote was carried with applause, and acknowledged by the PRESIDENT.

MR. J. H. CANNING'S PAPER ON "NEW ELECTRIC LAMPS."

The next item on the *agenda* was the reading of a paper by Mr. J. H. Canning, entitled "Some Notes on the New Electric Lamps." This will be found on the facing page.

The HON. SECRETARY said Mr. Canning was not present, and he had not heard from him. He thought, therefore, that the best plan would be to leave the paper over till the next meeting, as they had many interesting things to see that day.

Mr. J. C. PENNINGTON (Colwyn Bay) proposed that the paper should be taken as read, and discussed at the next meeting. They could have copies to read meanwhile; and he felt sure the result would be a very interesting discussion.

The PRESIDENT said he thought this would be the best course to pursue, though he would have liked to have heard his friend Mr. Langford give some account of his experience in his dual capacity at Longton.

The motion was seconded, and unanimously carried.

PLACE OF NEXT MEETING.

The PRESIDENT said that, with regard to deciding on the next place of meeting, he was in the awkward position of being without a house in the area of the Association. It would have been a delight to him, had he remained at Pontypridd, to have welcomed the members there; but under the circumstances, he thought it would be best, in the interests of all, to hold the next meeting at Cardiff. It would be at the time of year when many of them were not able to get far away. He therefore proposed that they should meet at Cardiff.

Mr. BROOKMAN seconded; and it was agreed to.

PROPOSED ALTERATION IN THE SEPTEMBER MEETING.

The PRESIDENT said he desired to give notice of motion that the Committee consider the advisability of changing the date of the September meeting. It had been pointed out to him that it was rather inconvenient to meet so soon after the holidays—and, in fact, when many were still away—and he should suggest the alteration of the date from the first week in September to either the last week in that month or the first in October. At any rate, he would give notice of motion that the matter should be considered by the Committee, in accordance with Rule 17.

Mr. PENNINGTON said he would support this. As a matter of fact, he had postponed his holidays so as to be at Shrewsbury that day.

APOLOGIES FOR ABSENCE.

Among those who expressed regret at not being able to attend the meeting were Mr. W. Doig Gibb, of Newcastle, President of the Institution of Gas Engineers, Mr. W. Prince, of Stoke-on-Trent, Mr. J. Davis, of Gravesend, Mr. H. Wilkinson, of Harrogate, Mr. H. W. Woodall, of Bournemouth, Mr. N. H. Humphrys, of Salisbury, and Mr. S. Johnson, the Chairman of the Gas Committee of the Burslem Corporation.

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Mr. A. W. ELLIOTT, the Assistant Manager, then read the following short description of

## THE SHREWSBURY GAS-WORKS.

The two gas-works in Shrewsbury show quite different lines of retort-house practice. At the old works, the retorts are horizontal, brick built, and are charged and drawn by hand; at the new works, the retorts are inclined, with a full equipment of coal and coke handling machinery.

### The New Works.

These works (which are separated from the old works by a large block of buildings) were erected in 1903, on land which had been in the possession of the Company for some years. In their design, the buildings and plant were so arranged that their capacity can be doubled with a minimum of inconvenience and expense. The nominal capacity of the works—as they exist—is 500,000 cubic feet a day, though in practice the retorts produce an additional 100,000 cubic feet a day when required.

The retort-house is 68 feet long by 51 feet wide. Extending along one side of the house, and divided from it by a wall reaching to the roof, is a coal-store 22 feet wide; the retort-house and coal-store being under one roof. In the support of this roof, the front and back buckstays of the retort-bench play an important part. These buckstays, together with the coal-store division-wall, also take the weight of the coal-storage hopper and the conveyor above it. Details of the construction can be seen conveniently from the retort-house interior. As this roof was the first of its kind erected, it may be pointed out that there has been no unequal movement of the structure since its erection. An examination of the exterior shows that the roof presents an even surface from any point at which a sight is taken. By the adoption of this method of construction, the height of the building is less by about 20 feet than is usual in inclined retort-houses. The charging and drawing floors are of reinforced concrete, supported by joists which are carried from the buckstays to the retort-house walls.

Coal is tipped from carts into the breaker-hopper, from which an automatic reciprocating tray-feed delivers it to the breaker. From the breaker, the coal is delivered, by means of a bucket elevator and a push-plate conveyor, into the coal-storage hopper. To supply the coal-store from the breaker, an additional elevator and a conveyor are provided. The coal-plant machinery is all driven by a horizontal steam-engine of 20 B.H.P. The coal-storage hopper extends the length of the bench, and is constructed to receive 60 tons of coal. Sliding doors (moved by levers) regulate the delivery of coal from the hopper to three Denison and Broadhead combined weighing machines and chargers—one charger for each horizontal row of retorts. There are four of Waddell's regenerator settings of eight retorts. The retorts are oval ⌂ in section, 20 in. by 16 in. at the top, widening to 24 in. by 16 in. at the bottom, and measuring 20 feet on the incline. The coke discharges itself on to a Dempster conveyor, by which it is conveyed up an incline, and delivered into a rotary screen. This screen sorts the coke into four sizes; each size being delivered into a separate hopper. A conveyor of the same description as the hot-coke conveyor receives surplus coke from the screen, and delivers it to the coke yard.

The ascension, arch, and dip pipes are 8-inch. The hydraulic mains are of semi ⊃ section, and are fixed in front of the ascension-pipes; thus they are quite clear of the settings. They are supported on steel joists extending from the front buckstays to the retort-house wall. Each hydraulic main is provided with a 4-inch flush-out pipe; two smaller pipes supplying the main with ammoniacal liquor. Bolted to the flat side of the main are two cast-iron boxes having removable lids. These boxes are so fixed that they give access to the interior of the main through liquor-sealed openings, and so permit any solid deposit to be removed without interfering with the regular working of the retorts. The foul main is 18-inch, constructed of steel plate, and carried along the retort-house wall, gable end, and side wall of the coal-store to the condensers.

The condensers are four in number, annular, 36 feet high by 4 ft. 6 in. outside diameter, and are constructed of steel plate. Near the condensers are the pump-house and boiler-house. Supported by the pump-house walls is a cast-iron tank, which is divided into three compartments for water, liquor, and tar. The boiler-house contains two Cornish boilers, each 24 feet long by 6 feet diameter. Both boilers are fitted with Meldrum furnaces. There are two exhausters of the rotary type, each of 25,000 cubic feet per hour capacity. Following the exhausters are a Livesey washer, two tower scrubbers (35 feet high by 10 feet diameter), a Pelouze and Audouin condenser, and a naphthalene washer. The Pelouze and Audouin condenser and the naphthalene washer were erected in the spring of this year, and have already done excellent service. The naphthalene washer is charged with the Leicester solvent.

The purifiers are raised 15 feet above ground level, and are carried on girders supported by I-steel uprights. The outer rows of uprights are 32 feet high, and at the top carry lattice girders, which support the roof. The purifiers are of the Green type, in one block, which is divided by cast-iron plates to make six boxes, each 20 ft. by 15 ft. They are worked by Weck valves, and are arranged in two sets—a set of four followed by a set of two. All are charged with lime. The lime is prepared on the ground level, and loaded into tip-waggons. Rails to take the waggons are provided on the ground level, and on the middle row of top plates of the purifiers. A hydraulic hoist conveys the waggons to and from the top rails. The spent lime is discharged through shoots either into tip-waggons or into carts. The station meter is rated to pass 25,000 cubic feet per hour. A small Cowan governor, in the meter-house controls the pressure of the gas supply to the works. Near the works entrance are the men's mess-room, with bath-room, weigh office, foremen's room, and small general store.

The gasholder at these works is 150 feet in diameter, and of 750,000 cubic feet capacity. This gasholder and the sulphate works were the only structures on the site up to the time of the erection of the new works. At the sulphate works the ammoniacal liquor is dealt with by concentration; a crude spirit containing about 15 per cent. of ammonia being obtained. The working up of the liquor has been attended with some trouble, owing to the difficulty of getting rid of the effluent. The present practice is to dispose of it by evaporation—as much as possible under the retort-furnaces, and the remainder by means of specially constructed evaporators.

### The Old Works.

The old works stand on ground which includes the site of the original works, which were erected after the Company was founded in 1820. As they exist, they are equal to a production of a million cubic feet per day. Owing, however, to the much lower working costs at the new works, the old works are only brought into use during the winter months—that is, when the demand exceeds the capacity of the new works.

The retort-house contains fourteen generator settings, each of six through, 22 in. by 15 in., ⌂ retorts, 20 feet long. The ascension, arch, and dip pipes are 6 inch. The hydraulic main is square in section, and constructed of steel plate. The foul main is also of steel plate, and is 18 inches diameter. It is carried along the two sides and the gable end of the retort-house to the condensers. Valves in suitable positions are provided to vary the length of

travel according to requirements. The condensers are of cast iron, and annular in section. Near the condensers are the boiler-house and the exhauster-house. The latter contains two Gwynne exhausters, each of 60,000 cubic feet per hour capacity. The gas, after leaving the exhauster, passes through two tower scrubbers—the first scrubber having a Livesey washer at the base. A naphthalene plant, similar to that which is so successful at the new works, is in course of construction, and will deal with the gas before it reaches the purifiers.

There are two purifier-houses; the larger having four boxes, each 24 ft. by 20 ft. No. 2 House originally contained four water-lute boxes, each 20 ft. by 12 ft.; but these, being of too small area, were converted to two boxes of the Green type, each 29 ft. by 20 ft. The governor and meter-room and the men's mess-room are in a two-storeyed building; the upper storey being used as a general store. There are two holders at the works, of 180,000 and 130,000 cubic feet capacity respectively. Before the gas leaves the works for the district, it is passed through a Cripps carburettor, and treated with benzol, if desired.

The old works also contain repair shops and stores for meters and stoves. At other parts of the yard are blacksmith's and works fitter's shops, also a coal-testing plant dealing with one-tenth of a ton at a time, which is of great value.

Mr. BELTON said he would like to supplement the remarks of Mr. Elliott by telling them that when the old works were built in 1820, Mr. Grafton was employed as Engineer. He had just previously completed the works at Derby and Wolverhampton. Some time afterwards in the original minute-book of the Company there was recorded the fact that Mr. Grafton was dismissed from his position as Engineer of the Shrewsbury works because he had ordered too many pipes, tees, and bends, and after the main-laying had been completed there were some left over. In 1824, there was another very curious entry in the minute-book. It seemed that a gasholder-tank which was now converted into a liquor well had just been completed, and the pipes were laid in the bottom, but the stand-pipes were not put in. Mr. Green conceived the idea of filling a balloon in the tank, and was permitted to do so. It held about 16,000 cubic feet of gas; and when it had been filled in the tank, it was carried to a field a short distance away from the works, and there exhibited for three or four hours. Mr. Green then made an ascent (in which he attained an elevation of about 2½ miles), and landed somewhere in Radnorshire—about 34 miles from Shrewsbury. This he believed was one of the first instances of coal gas being used for the filling of balloons. He happened to come across these entries in the original minute-book of the Company a few days ago, and thought they might be of interest. His Directors hoped that, after the inspection of the works, all those present would partake of tea in the town.

### THANKS TO THE SHREWSBURY GAS COMPANY.

The PRESIDENT proposed a hearty vote of thanks to the Chairman and Directors of the Shrewsbury Gas Company, and to Mr. Belton, for the use of the offices for the holding of their meeting, and for the hospitable way in which they had been received. It was almost proverbial in Shropshire what the Gas Company had done. Mr. Belton's name was as well known as, or better even than, that of their own Member of Parliament. It was a long time since he first made the acquaintance of Mr. Belton; and he remembered the good advice he gave him then—some sixteen or seventeen years ago. He had always regarded him as being one of the best members of the profession. He had steadily gone on; and not only Shrewsbury, but a great deal of the county, owed very much to him.

Mr. PENNINGTON, in seconding, said Shrewsbury appealed to him as an old town, and he was pleased to be present.

The vote having been heartily agreed to,

Mr. BELTON returned thanks on behalf of the Directors, and again expressed their regret that absence from home and other unavoidable circumstances had prevented any of them being present. None the less they welcomed the Association, and were glad that the members should come to see their works, of which they naturally felt a little proud themselves. On his own behalf, also, he returned thanks for the flattering references that had been made to him. Of course, one could not live for some thirty years in a district without being pretty well known. He trusted that during his career at Shrewsbury he had made a good many friends; and he did not think he had made any enemies. At all events, he had always tried his best to do what should be done, and had devoted all his energies and such abilities as God had blessed him with to the service of the Company. If he had met with a fair measure of success and appreciation from the Company and the public, he was perfectly satisfied.

### AUTHORS OF PAPERS THANKED.

The HON. SECRETARY moved a hearty vote of thanks to Mr. Elliott for his paper and for all the trouble he had taken; and also to Mr. Canning for his contribution.

Mr. BROWNING seconded.

The PRESIDENT said he hoped for a very good discussion on Mr. Canning's paper at the next meeting.

The vote was heartily accorded; and Mr. ELLIOTT replied.

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The members then proceeded to inspect the gas-works, at the conclusion of which brakes which were in attendance conveyed them to the Shrewsbury Café, where the excellent meat tea which was provided for them was thoroughly enjoyed.

## SOME NOTES ON NEW ELECTRIC LAMPS.

By J. H. CANNING, of Newport (Mon.).

**[A Paper prepared for the Wales and Monmouthshire District Institution of Gas Engineers.]**

In the following brief and rapid survey, much that is already well known must unavoidably be included. Still, as it is essential, in competition of every kind, not only to be well acquainted with one's own position, but to have a general knowledge of one's opponent's, it has occurred to the writer that a few remarks on the latest developments in electric lighting may be of use.

In the earlier days of electricity, many attempts were made to produce a satisfactory incandescent lamp with a metallic filament. Platinum and some others of the more refractory metals were made use of to this end. But, for various reasons, none of these lamps were commercially successful; and incandescent electric lighting first entered into general competition with gas upon the invention of the carbon filament lamp with Edison thirty years ago. At that time, and for many years after, the flat-flame gas-burner was the one in ordinary use. But after the invention of the incandescent gas-light by Welsbach, electricians strove to press the rare earths into their service; and the outcome of their endeavours has been the well-known Nernst lamp. For reasons, however, to be detailed later, the earths which were so easily adaptable to the purposes of gas lighting proved somewhat intractable when electricity was used as the heating agent; and invention harked-back, as it almost always does, to the earlier idea—viz., the metallic filament lamp.

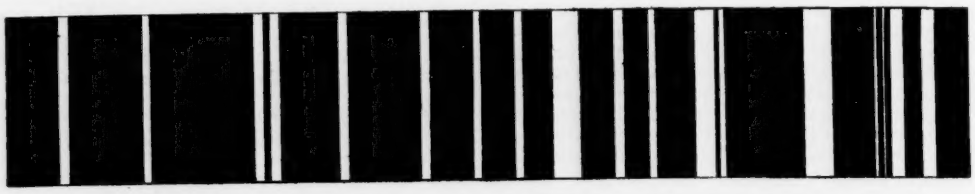
The steady advance of chemical science in the interim made available for the electrician's purpose a number of refractory metals almost unknown to a previous generation; and the result is before us to-day in the numerous "metallic" and "metallized carbon" filament lamps for which such remarkable results are claimed and promised. At the same time, the first known form of electric illumination—the arc lamp—was not overlooked; and attempts, more or less successful, have been made to improve its efficiency, which have resulted in the so-called "flame" and the "mercury vapour" arc lamps. These various types of lamp will now be dealt with more in detail.

*The Mercury Vapour Arc Lamp.*—This consists of a vacuum tube containing mercury and its vapour, through which an arc is started by the tilting of the tube; thus establishing momentary contact. The lamp will work only on continuous current at low voltage; and though an efficiency of 0·4 watt per candle power is claimed for it, the lamp has not been adopted to any extent, owing to the weird, unearthly character of the light omitted by it, in which the red rays are entirely absent. It is proposed to remedy this defect (by adding sodium and other metals to the mercury, or by the device of running a glow lamp in conjunction with the arc), but, up to the present without much success, as the efficiency is thereby considerably reduced.

*The "Flame" Arc.*—This lamp has been far more in evidence as a competitor with gas lighting than the one previously alluded to. It owes its unique and peculiarly coloured glare to the fact that the carbons employed are impregnated with various volatile salts in order to increase their efficiency. A longer arc is consequently produced; and the carbons are so inclined to each other (similarly to the legs of the letter V) that the arc lies in the horizontal plane—its position being further controlled by means of a magnetic field. The makers of these lamps claim for them an efficiency of about 0·13 watt per candle power; but as estimates of the candle power vary as much as 100 per cent. from each other, extremely little information is available upon the point. While it may be observed that, according to information presented to the Birmingham Section of the Institution of Electrical Engineers, a 9-ampere flame arc costs as nearly as possible, for current at 1½d. per unit, carbons, and trimming, £20 per year of 3700 burning hours, still the question of cost has been so often and so ably dealt with elsewhere that it is not proposed to go into it more fully in this paper.

Though the actual intensity of the light is very great, this lamp possesses in an accentuated degree the great defect of all its predecessors—viz., the concentration of practically the whole of its light upon a very limited space immediately beneath it. It is quite unnecessary to labour this point, or to draw attention to the fact that, for street lighting in particular, this is not only not the best method of illumination, but may become a source of positive danger.

But the flame arc has opened out for itself a new field and a fresh title to fame in its application, under a complete misapprehension, to advertising purposes. Tradesmen in the past employed lamps chiefly for the purpose of exhibiting their wares to the best advantage, and they used and paid for the quantity of light necessary for the purpose. A mistaken notion—rather the effect of suggestion than of intuition—has, however, become prevalent among them, that to secure custom it is necessary to exhibit on a shop-front the most glaring lamp to be obtained. It is perfectly evident that, however suited such methods of attraction might prove to a community of Hottentots or Tonga Islanders, it is rating the intelligence of the average educated Briton at a very low level to dangle before him these blinding




**Spectrum of a Flame-Arc Lamp.**

and flickering lights, which, according to one of the leading electrical journals, attract none but "moths and loafers."

It is essential to point out strongly to all present or prospective consumers that, as obtains in the case of every other commodity, there is a certain quantity of light necessary in every instance, and to pay for more is sheer waste. The electrician is unable to subdivide his immense units of light, and he foists them wholesale upon the consumer, who is led to fondly imagine that the enormous waste of energy will in some occult manner bring him a golden harvest. While the writer is fully aware that these lamps are sometimes hired to consumers by electrical undertakings at unremunerative and inclusive rates, yet it may be pointed out that such lights are confined to the outside of business premises of which the proprietor in nearly every case finds it more advantageous to light the interior by means of the incandescent gas-light.

The mechanical and other defects of the lamp are numerous; the most important being: (1) The poisonous fumes produced, which make the use of the lamp dangerous in a room and ruin the mechanism. (2) The volatilized salts also condense upon the globe—obscuring it, and endangering the electrical insulation. (3) The carbons are costly, and leave a large amount of ash. (4) The unpleasant hue of the light emitted.

With reference to the last of the above defects, it occurred to the writer that, the light of the flame arc being derived from incandescent vapour, the spectrum of this light would prove to be in great measure a non-continuous one; and careful examination with a spectroscope has confirmed this supposition, the spectrum being approximately as shown on the diagram. The spectrum of the sun and of practically all artificial illuminants is continuous, embracing light of every wave length within certain wide limits; and the ideal of all who have studied this subject seriously has been to produce a light approximating as nearly as possible to that of the sun in quality.

Here, however, we have a distinctly retrograde step. The flame arc spectrum is not continuous in any sense of the word; consisting almost entirely of the line spectrum of calcium, with traces of potassium and other metals. Large gaps exist in all portions of the spectrum; the consequence being that such a light imposes upon everyone complete colour blindness, *nolens volens*, not in respect of one colour only, but of nearly all shades of colour. The streets of our towns are hardly so beautiful at the present day that we can afford to see them robbed of the small attractiveness they possess. What an eminent scientist calls "a fortuitous concourse" of odd rays taken at random from distant points in the spectrum, can no more be termed illumination, than can the sound produced by a piano with nine-tenths of its keys missing be called music.

Another aspect, and a more serious one, presents itself. That long-suffering but most wonderful and delicate of organisms the eye, cannot long withstand the strain to which it is subjected by the light emitted by these and similar lamps. There may be upon other planets eyes so constructed as to view objects in a light such as this without inconvenience. The human eye, however, is not so fashioned; and the attempt to accustom it to such unnatural methods of illumination must result in strain and eventual disaster.

Let any unprejudiced person view in turn the goods in shop windows illuminated respectively by means of the flame arc and the incandescent gas-light, and he will be compelled to admit that the latter not only exhibits the goods to better advantage, but enables a prospective customer to examine them at his ease without being driven away blinking and half-blinded, as so many are, by the glare of the former. Tradesmen are rapidly adopting this view of the case; many of them having discovered, to their cost, that the flame arc, throwing its splashes of tawny light over a shop front, really possesses a repulsive rather than an attractive effect.

*The Nernst Lamp.*—In this type of lamp, a small rod made of metallic oxides, similar to those so successfully employed in the incandescent gas-mantle, is heated by an electric current. The rare earths, however, are non-conductors of electricity when cold; so that a heating device must be attached to each lamp in order to raise the temperature of the glower to the point at which it becomes a conductor. This work being achieved, the heater is automatically cut out. Another difficulty presents itself in the fact that the resistance of the rod, when thus reduced, does not remain constant, but progressively decreases—necessitating a second device termed a "ballasting resistance," which usually consists of an iron wire sealed into a tube containing hydrogen.

When first put upon the market, an efficiency of 1·2 watts per candle power was claimed for this lamp. Practical use, however, has demonstrated the fact that 2 watts or even more per candle power is a more accurate estimate of the quantity of current consumed; while the apparent economy over the carbon filament lamp must be largely discounted, owing to the glower, which is expensive, having a life not exceeding 200 hours, and frequently falling as low as 50 hours.

It might reasonably be expected that in the Nernst lamp—combining in itself, as it does, an electric lamp, an electric heater, an automatic cut-out, and a resistance, each with its numerous defects—the probability of failure of the whole would, following the well-known law, amount to the sum of the probabilities of failure of the separate portions. Experience has amply demonstrated that this is the case, as all the component parts of the lamp require frequent renewal at some considerable expense; and the makers have recently fitted more than 20,000 lamps with the new cut-out coils free of cost—the older types having proved to be most unsatisfactory.

*Metallic Filament Lamps.*—Carbon does not yield so good a return in light rays for the heat energy expended upon it as metallic bodies do; but great difficulty has been experienced hitherto in the successful application of metallic filaments to electric lighting, due to their comparatively low fusing-points and resistances. Nearly all the metallic elements known to modern chemistry have been examined with a view to ascertaining if they possess the necessary physical properties; and though no metal even remotely approaching the electrician's ideal has been found, such out-of-the-way elements as iridium, osmium, tantalum, tungsten, zirconium, and molybdenum possess, in varying degrees, some of the necessary attributes.

With more or less success, certain of these metals, notably tantalum, osmium, and tungsten, have been formed into threads comparable only with those of the spider in their extreme tenuity. Still, in order to obtain the necessary resistance, about 25 inches of such filament are required for each lamp; and, as may well be imagined, the most minute care and the greatest manual skill are necessary in winding the fine metallic thread upon its supports. Some idea of the slender nature of these filaments may be obtained from the fact that 1 lb. of tantalum furnishes 20,000 lamps, each of which, therefore, contains only about $\frac{1}{3}$ grain of the metal.

The best known and the most generally used of these lamps are the "Osmium," the "Tantalum," and the "Osram." These are typical examples of a class whose number already threatens to become legion. Of the three whose titles are given, the first two bear the names of the metals respectively employed in their manufacture; while the filament of the third consists of an alloy of osmium and tungsten.

The most remarkable efficiency—even 1 watt per candle power—has been claimed for these lamps by the makers; while electricians who use them do not claim an efficiency higher than from 1·3 to 1·6 watts per candle power. Recent tests by independent authorities seem, however, to indicate, a duty little, if any, better than that of the Nernst lamp. On the other hand, whatever may be the advantage realized in the consumption of current, these lamps possess inherent defects which militate immensely against their general adoption. The filaments are so fragile that one authority doubts if any but a limited number will survive the perils of transport, fixing, and dusting, and thereafter complete their allotted span, which appears not to exceed 600 hours on an average. The lamps possess a decided objection to alternating current or to any voltage above 130, having to be run in series on all modern high-pressure supplies. In order that even this may be possible, they require to be most carefully paired, or certain disaster will result.

In consequence of the semi-fused or plastic state of the hot filament, very few of these lamps may be fixed in any but the vertical position, when, owing to the method in which the filament is wound, little or no direct light is thrown vertically downwards; and a reflecting top has been found necessary so as to overcome this defect. In addition, variations in the pressure of supply affect the lamps most injuriously, due probably to the fact that the heating effect of the current varies directly as the square of the number of amperes, or, resistance being assumed constant, as the square of the voltage. Consequently small upward variations in pressure tend to produce fusion or volatilization of the filament. In fact, the blackened condition of many of the bulbs of these lamps seems to indicate that the latter action is constantly taking place under normal conditions. The alternate expansion and contraction of the filament when the lamp is switched on and off is also a fertile source of failure.

The history of the electrical industry for many years has been that of a series of compromises with the inexorable laws of physics and of economics. Nor do the metallic filament lamps present an exception to this rule. Owing to the high price of copper during the last few years, almost every electrical undertaking in the kingdom has doubled the voltage of its supply; and hardly has this been accomplished when, by the irony of fate, a more economical lamp, suitable only for low voltage systems, however, is produced. Those undertakings which retained low-pressure supply with its high cost of distribution, appear to be little, if any, better off; as great fear is expressed by electrical engineers that the load factors of these concerns, built up with such care, will be ruined by the employment of the more economical lamps.

Much has been said lately to the effect that these more efficient methods of lighting would at length bring electricity within reach of the working man, who is represented as possessing a most insatiable craving for the introduction of this agent into his dwelling for lighting purposes. The metallic filament lamps cost at least 4s. each, and it may be at any rate surmised that the working men of this country are not prepared to spend for each renewal of their electric lamps a sum for less than which two complete incandescent gas-burners, with chimneys and mantles, may be had; while, on the other hand, if electrical undertakings free-wire the houses, making an inclusive charge for energy to cover interest, renewals, &c., it is very probable that the improved efficiency claimed for the new lamps will become a dead-letter owing to the prohibitive charge for current. However, even under the most favourable circumstances—allowing the very high efficiency of 1·3 watts per candle power, current at 3½d. per unit (which is less than the average charged over the whole kingdom) and a life of 600 hours—the following comparison of the cost of two 32-candle power osram lamps and of an incandescent gas-light of equal power over a year of 1800 hours will show that there is no ground for supposing that our industry will fail for a moment in maintaining its premier position.

*Electricity.*

| | | | |
|---|---|---|---|
| Two osram 32-candle power lamps, at 1·3 watts per candle power for 1800 hours—energy consumed (say) 149 units, at 3½d. | £2 | 3 | 5½ |
| Renewals, six lamps, at 4s. each | 1 | 4 | 0 |
| Total | £3 | 7 | 5½ |

*Gas.*

| | | | |
|---|---|---|---|
| One 64-candle power incandescent gas-burner, consuming (say) 4 cubic feet per hour for 1800 hours = 7200 cubic feet at 3s. | £1 | 1 | 7½ |
| Renewals, three mantles, at 4½d. each | 0 | 1 | 1½ |
| Total | £1 | 2 | 9 |

An examination of the comparison will show that, though a generous allowance of gas and mantles has been provided, yet, for equal amounts of light, incandescent gas is only one-third the cost of the most efficient of the metallic filament lamps. Another and a very important point is that, while renewals form upwards of one-third of the total cost of running the electric lamp, in the case of the gas-lamp they amount only to a twentieth of the total. A life of 600 hours has been allowed these lamps for the purposes of the preceding comparison. But the writer has ascertained that the actual average life of a tantalum lamp in a shop window where it is exposed to the vibration of traffic is only 216 hours; while of two osram lamps fixed in series in a similar position, one failed after less than five hours' burning—consequently throwing both lights out of action.

While the writer yields to no one in his admiration of the high scientific knowledge and technical skill expended upon the production of these lamps, still the consumer (who is supreme in these matters) pays scant attention to even a miracle of ingenuity unless its beneficial influence is distinctly evident upon the credit side of his balance-sheet. The rivalry between gas and electricity will not be settled upon the photometer-bar, or even by the portable photometer, whose reputation for veracity is second only to that of the expert witness. But the battle must be fought and decided in the public streets and in the houses of the people, who, after all, are the best and the only judges of that which so intimately concerns them. The gas industry may, with every confidence, leave the issue in their hands; for, upon the score of efficiency and of economy, the incandescent gas-light is up to the present unrivalled, and bids fair in future to be unassailable.

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The Gas Department of the Nottingham Corporation has lost one of the oldest employees connected with the undertaking in the person of Mr. John Reeve, who died on the 2nd inst., in his 70th year. He entered the service of the Nottingham Gas Company when he was a lad, and quickly advanced to a position of trust; and his business capacity was recognized by the Corporation soon after the gas-works were acquired in 1874, when he was appointed Superintendent of the Distribution Department. This post he held with conspicuous success. Altogether his services extended over the long period of 58 years. He was universally respected, and his relations with the men were of a most cordial nature.

## INVERTED LIGHTING WITH IGNITION FROM A DISTANCE.

A recent issue of the "Journal für Gasbeleuchtung" contained the text of a paper on the lighting from a distance of gas-burners for public and private purposes, read by Herr G. Kern, of Strassburg, before the last meeting of the German Association of Gas and Water Engineers.

### Private Lighting.

The author began his communication by expressing the opinion that in a house pilot-flames were often dangerous and sometimes not wholly devoid of odour. Hence the system of lighting from a distance most suitable for application to the burners of a private residence was one in which, without the aid of such pilots, the gas was ignited and afterwards extinguished from any desired spot. Unfortunately the only plant at present available that answered this requirement was the invention of Herr Mohrstein, and was known as the "Multiplex." Its essential feature consisted in producing a spark by means of a battery yielding a current of between 4½ and 9 volts, and an induction coil, the make-and-break of the current being obtained by mechanical agency. As the production of a 1 mm. spark in air which could be trusted always to ignite a stream of gas required a voltage of about 5000, the primary current had to be raised to a voltage of as many times 5000 as there were burners in series to be lighted by the same battery. The induction coil of the Multiplex comprised a spring, set in motion by hand, which interrupted the current periodically in the usual fashion for a considerable period of time. In places where æsthetic considerations did not have to be studied, the gas-cocks of the Multiplex were opened and closed by hand, and were generally placed quite close under the burners, arranged after the manner of a chain cock. In other places, a special electromagnetic cock-opener was employed which could be operated from any distance and would control inverted burners as well as upturned burners. These electric cocks were usually fixed within the ornamentation of the pendant or bracket, so as to be invisible. They were made in various sizes according as they had to pass gas for one or more individual burners. Herr Kern remarked that the cock should be placed as near to the burners as possible, and that the tube between them should be as narrow in diameter as could be arranged, so that the air might be expelled without delay, and a long succession of sparks not be required before the gas was ignited. He also considered that, as in the case of other distance lighting appliances, it would be advantageous if the makers of the Multiplex were to supply the trade with their lighting devices as integral parts of pendants and the like, in order that the erector should only have to connect them up with the battery and the switch. In this way, the complete fitting would be more elegant in appearance than when the lighters were simply screwed on to some part of a bracket or pendant designed for other purposes.

At the time of reading his paper, Herr Kern stated that 262 Multiplex installations were out on loan in Strassburg among gas consumers; 150 of them being in hotels, 72 in business houses, and 40 in private residences. The burners in each installation ranged from 3 to 136 in number; the gross total being 2418, more than half of which were inverted. Including the expense of teaching the men how to assemble the apparatus, these installations had cost the gas undertaking about 18 marks per burner; but the further experience that had since been gained allowed a single upturned burner provided with a hand-worked cock to be erected for about 8 marks, exclusive of the battery. The present cost of erecting a single inverted burner fitted with the electromagnetic cock mentioned above came to about 17·80 marks; and the author stated that it would pay the gas-works to let the Multiplex lighters out on loan among their customers at the rate of 1 mark per burner per month. The cost per single burner of fitting up grouped lights controlled by a single Multiplex was less, and might be as little as 8·90 marks inclusive of battery. The staff employed erecting Multiplex lighters in Strassburg comprised an inspector, foreman, and ten fitters and labourers; and it was worth noticing that the system had enabled the proprietors of the gas-works to win back some old consumers who had adopted electricity on account of the advantage of the switch.

Herr Kern said there was some difficulty in quoting the average cost of maintenance. For example, in his show-room at Kehl, he had an installation comprising a six-light pendant and four brackets which was working perfectly and did not require any particular attention; whereas in his own house he had one ten-light, one six-light, and three three-light pendants, besides a number of single burners, connected with the Multiplex lighter, which required examining at least once a month. It was very necessary to remember that the chief requisite in maintaining any distance lighter in good condition was that the ordinary gas fittings and pipes, &c., should be perfect. Therefore, in the case of a private residence, special care should be taken by the men erecting a Multiplex that the whole of the existing plant was satisfactory, lest any stoppage in the service, or breakage of the chimneys round the mantles, should be reported by the consumer as a breakdown or as the fault of the automatic lighting arrangement. On the assumption that the whole of the ordinary gas-fittings were in perfect condition, there were four chief matters to look after in keeping

an installation of Multiplex lighters in satisfactory order. It was necessary to see that: (1) the battery was strong enough; (2) the induction coil was in order, and that the electric cock was tight; (3) the electrodes were clean and in correct positions; (4) too long a succession of sparks was not required to light the gas or, in other words, that the cock was not so far from the burner that the gas took an appreciable time to reach it. In this event, the only remedy was to bring the cock nearer the burner. Naturally, however, it must not be exposed too greatly to the heat, and in a downright inverted burner it should be kept at some distance from the light. If there were no short-circuit about the battery, and yet in ordinary circumstances it did not last for a year, the number of cells should be increased.

Herr Kern concluded his remarks on the subject of the Multiplex by pointing out, first, that the appliance was different from other distance lighters, inasmuch as one cock would, if required, control several lights; and, secondly, that since it was expensive and complicated to fit up, it could only be introduced in towns where the gas undertaking had an outdoor department.

### Public Lighting.

In the second part of his paper, Herr Kern proceeded to discuss the various automatic arrangements that had been devised for lighting the public lamps of a town, dividing them into three classes, according as they were actuated by clockwork alone, by clockwork temporarily released by a wave of pressure, or by successive pressure waves alone. Nearly all the appliances, he said, hitherto invented required a pilot-flame consuming some ¼ cubic foot per hour at each burner. This was a very serious defect, not only because of the danger that the pilot might be extinguished by wind, but also because the consumption was too large to be ignored. The lighting arrangements that had been tested for the longest period of time were those of the first class, and depended for their action upon clockwork only. The oldest was probably that devised by Rothenbach about ten years ago, which had been taken up by the Aktiengesellschaft für automatische Zünd und Löschapparate, of Zurich. It had recently been modified, and was now known as the "Zula."

It consisted of an accurate sixteen-day clock movement enclosed in an aluminium box, dust and water tight. At one side there was a face on which the time could be read in the ordinary way. Part of the casing could be removed to render the mechanism accessible, so that the times of lighting and extinguishing could be set by hand; but the appliance was also fitted with a special disc that altered these times automatically according to the season. The ordinary lantern cock was replaced by a metal valve normally resting on its seat, and so closing the gas passage. During the time when the burner was alight, however, the clock movement held the valve above its seat and allowed the gas to pass. The ignition of the gas was performed electrically with the aid of an influence machine driven by the clock; several sparks being successively passed between the terminals, for fear the first might fail to ignite the gas. At the moment when the mechanism began slowly to open the main gas-way, a jet of gas was liberated inside a protective casing, and, inflamed by the spark, yielded a non-luminous flame, which promptly lighted the gas of the burner proper. The whole appliance cost about 60 marks.

Another public distance gas-lighter, of which 6000 specimens were now in use, was made by the "Deutsche Gaszünderfabrik Elberfeld." In this apparatus one face was provided for reading the time, while the other was fitted with a pair of special hands. As soon as the first hand reached its highest point, a lever moved, and the plug of the gas-cock was turned round until it was fully open. When the second hand arrived at its highest point, the operation was repeated, and the gas-cock was closed. The clock had two springs, and required to be wound up every fortnight. The apparatus cost about 37 marks.

In passing, Herr Kern mentioned that the Gunning and the Horstmann* apparatus, which, like the Zula, automatically adjusted the times of lighting to the seasons, were largely adopted in England, and that several devices of similar character were being tried in France.

The author next described the distance lighters introduced by Kilchmann, of Wohlen, one of which belonged to the first class and the other to the second, being partly actuated by clockwork, and partly by a wave of pressure coming through the main. The clockwork itself in the latter was very much like that in the lighter which required no pressure wave; and both were enclosed in double cases to protect them against rapid changes in temperature and to prevent evaporation of the lubricating oil. The gas valve was placed within the lantern—that is to say, close to the burner, and was opened and closed by a lever moved by the train of clockwork. The leather membrane which transmitted the wave of pressure was placed underneath the clockwork, and was used to liberate the latter. The pressure wave lasted two or three minutes, opened the gas-valve slowly, so as not to expose the mantle and chimney to a sudden change in temperature, and finally extinguished the pilot-flame through the agency of a valve connected with the valve on the main supply pipe. The clockwork consisted of only four wheels driven by means of a strong spiral spring; and since it remained stationary, except during the few minutes when the flame was being lighted and put out, it only required winding up about every six months. The pilot-flame was fixed close to the burner, and surrounded with a jacket to protect it from the wind. The Kilchmann pressure lighter could be so arranged that a second wave extinguished certain lamps only, while a third wave extinguished the remainder. The apparatus for use in conjunction with a wave of pressure cost 32 marks; whereas that in which the whole cycle of operations was effected by the clockwork cost 38 marks.

The third class of appliances were those actuated merely by a wave of pressure, the chief example of which was the "Bamag."* In referring to this distance lighter, the author mentioned that experiments had been carried out with Bamag pressure-recording gauges placed on the gas-main at distances up to 3½ miles from the gas-works which showed that the pressure wave of 31-10ths —*i.e.*, of 8-10ths above the highest night pressure—was communicated with absolute sharpness to the extremities of the distributing system, and that its passage through the mains did not produce the least prejudicial effect upon either the public lamps or the sensitive inverted burners alight on the gas-works or in different parts of the district. The Bamag was undoubtedly an excellent apparatus; but in the author's opinion it did not lead to any economy in the consumption of gas. Indeed, in a place like Strassburg, if the loss of gas caused through hand lighting were represented by the figure 100, the loss through hand extinction at midnight or in the morning would be altogether 200, whereas the unavoidable waste due to the permanent pilots would reach 900. The economy attainable by the employment of a distance lighter must be rather sought in the wages of the man attending to the burners. According to figures derived from the gas undertaking at Neumünster, where one man formerly lighted 70 lanterns by hand, and where 170 Bamag lighters had been employed since June, 1905, the economy amounted to about 5·90 marks per lantern per year. Herr Kern quoted numerous satisfactory opinions passed by the authorities in different towns upon the Bamag apparatus. At Darmstadt, trouble had arisen owing to the frequent extinction of the pilots, but that was undoubtedly due to the faulty construction of the lanterns. At Salzwedel, 200 Bamags were at work on a distributing system some eleven miles long. A wave of pressure equal to 35-10ths was transmitted for a period of two minutes, and acted perfectly. The mantles and chimneys were reported to last one-fifth longer than before. The economy in gas was said to be very marked, and no complaints were received as to the premature or dilatory lighting and extinction of a lamp. At Durlach, 180 Bamags were employed, actuated by a wave of 24-10ths to 35-10ths over a period of two or three minutes. Although the distributing system was somewhat badly dimensioned there, the apparatus worked perfectly, and again no complaints were received from the consumers about the temporary pressure.

After citing a few other gratifying opinions on the "Bamag," Herr Kern went on to describe the "Rostin" lighter, which, so to speak, differed from the Bamag as a wet meter differed from a dry. In the Rostin lighter the wave of pressure first opened two floating valves, whose movement suddenly admitted the pressure to the bell of the apparatus which floated in mercury, the movement of the latter also actuating the lighting arrangement quite suddenly. By this system of construction, even a comparatively weak pressure wave would actuate a cock that did not move very freely. In the Rostin apparatus it was necessary that the wave should last for about ten minutes, and that the pressure between the lighting and the extinguishing waves should fall to the normal amount. Furthermore, the adjustment of the Rostin was very troublesome, and it occupied twice as much space and cost twice as much money as the Bamag. Experiments had been in progress in Mannheim since 1905 with this particular form of lighter, but had not yet yielded satisfactory results. Nevertheless Herr Kern understood that the Rostin was employed largely in England, and was becoming a successful competitor to the Bamag. The author felt some objection to any apparatus requiring the use of mercury or glycerine, and he considered, moreover, that any lighter ought to be so arranged that the gas could be led round it and the flame turned up and down by hand.

Himmel, of Tubingen, has designed a distance lighter which is very compact, strong, and cheap, costing only some 25 marks. The "Himmel" lighter consisted of a horizontal lever actuated by the movements of a horizontal diaphragm exposed to the pressure. The mechanism also comprised a pair of levers which opened or closed the main valve; one of them being provided with a tripping device which masked its driving pin so that the second wave of pressure did not extinguish those burners that were intended to remain alight all night. When, however, the second wave raised the lever to its highest point, the tripping gear was knocked on one side; and therefore on its next rise, the pin threw over the main lever and closed the gas-cock. The whole lighter was placed in parallel with the main gas-way, so that any lantern could be lighted or extinguished by hand. Herr Kern believed that the Himmel apparatus would prove successful when adopted on a large scale.

The author concluded his paper by referring to a few less known distance lighters, first singling out for mention the "Lichtwart," designed by Herr Broel, of Velbert, where some seventy specimens had been in use for about two years. The lighter comprised a bell floating in mercury and so weighted as to be raised by a wave of pressure only 6-10ths above the normal maximum. Through the agency of a ratchet, the rise of the bell moved a

* See "JOURNAL," Vol. XCVII., p. 604.

* See *ante*, p. 568.

wheel forward one-sixth of a revolution. On the same spindle was a second detachable wheel carrying a number of pins adjustable in position and number. These pins moved the gas-cock in the manner and at the times desired; and since two such wheels could be applied to each lighter, two burners in any one lantern could be extinguished at different times. The lighter could be cleaned in position by using alcohol or benzol. The Lichtwart would work with 170 grammes of mercury, whereas the Rostin required 800 grammes.

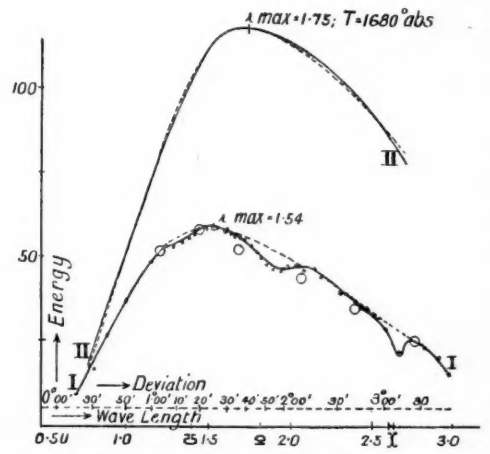
An apparatus called the "Schwarzkopf" designed by Herr Burgemeister, of Celle, had been successfully tried in Landsberg. It was characterized by possessing no mechanism at all, and was perhaps even too simple. The lighter consisted of a receptacle filled to a certain height with glycerine, through which the service-pipe passed almost to the top. Inverted over the pipe was a small bell, having an S-shaped tube within it, which acted as a hydraulic seal. When the pressure was normal, the tube was full of glycerine and prevented the gas from passing to the burner. On the arrival of a wave of positive pressure, the glycerine was forced out of the tube, and the gas reached the burner. When the pressure fell to its normal value again the burner continued alight, because the level of the glycerine in the bell was still depressed below the mouth of the S tube. In order to extinguish the burner, a wave of negative pressure was sent through the main for a few moments. This caused the glycerine to be drawn back under the bell so as to seal the tube—a quantity of liquid entering the latter and remaining there until the next wave of positive pressure was sent out. The apparatus was rather difficult to adjust at first, but worked well when adjusted properly. It seemed questionable, however, whether the sudden reduction in pressure would not introduce various troubles, especially with inverted burners.

Herr Kern also said a few words in favour of the "Nebendahl," the "Milbert," and the "Pharos" lighters, but could not regard apparatus requiring a pneumatic or electric attachment to each street-lamp as being successful competitors with the others or fit for the control of inverted burners.

## TEMPERATURE OF INCANDESCENT PARTICLES IN LUMINOUS FLAMES.

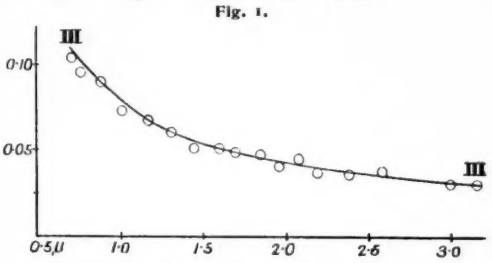
Some experiments have been carried out recently by Herr Rudolf Ladenburg, at the Technical High School at Charlottenburg, upon the emissive and absorptive power of various luminous flames. An account of his processes and results was published a short time ago in the "Physikalische Zeitschrift," from which the following particulars are obtained.

The object of the research was to ascertain the relationship between the absorptive power of the incandescent particles of carbon in a flame and the wave length of the light; thence to calculate the energy phenomena of a "black" body possessing the same temperature as the carbon particles; and so, with the aid of the emission curve of the flame, to deduce the temperature of the incandescent carbon particles therein. The emission curve of the flame was ascertained by means of a Rubens mirror spectrometer, a quartz prism with an angle of 60°, a thermopile, and a Panzer galvanometer—the results obtained being reduced in the usual manner for the normal spectrum. The image of the flame was thrown from a concave mirror upon the slit, so that only an accurately defined portion of the flame was used for the investigation. [Herr Ladenburg remarks that, in the region studied, quartz disperses so uniformly that no displacement of the maximum is introduced through the breadth of the thermopile or of the slit. Stewart found considerable displacement; but he employed a prism of fluorspar.] In order to measure the absorption of the flames, the rays of a Nernst lamp were thrown, by means of a concave mirror, upon a slit 1 m.m. wide and 5 m.m. long; the image of the slit being reflected from a second concave mirror upon the slit of the spectrometer, whence the light was reflected by a third concave mirror into the prism, and finally was reflected again from a plane mirror on to the thermopile. The flame under examination was placed in front of the first slit in such a position as to present to the Nernst light the portion of the flame whose emissive power was to be determined. The energy of the flame itself, of the Nernst lamp (when the effective width of the slit was gradually changed between 0·1 and 1·0 m.m.), and the energy of the Nernst lamp *plus* the energy of the flame, &c., were determined for each wave length over the whole region between 0·7 and 3·1 $\mu$. The Nernst lamp was supplied with current from fifty accumulators; and during the investigation at each wave length, which occupied from three to five minutes, its intensity did not vary more than $\pm \frac{1}{4}$ per cent.—the heating of the slit producing no effect upon the thermopile. Nevertheless, the accidental variations in the flame were such that the individual measurements could not be carried out more precisely than to within $\frac{1}{2}$ per cent. of the energy emitted. The flames that were examined were firstly that of a standard Hefner lamp, and secondly that of acetylene consumed at a double steatite burner so placed in regard to the axis of observation that the flat side of the flame presented an angle of 45° thereto. The acetylene was generated from carbide of calcium, purified with "acagine" [a proprietary mixture of bleaching powder with lead chromate], and then passed




I. Energy Distribution of the Hefner Flame for Normal Light.
II. " " " "Black" Flame.

Fig. 1.




III. Total Absorption of the Hefner Flame.

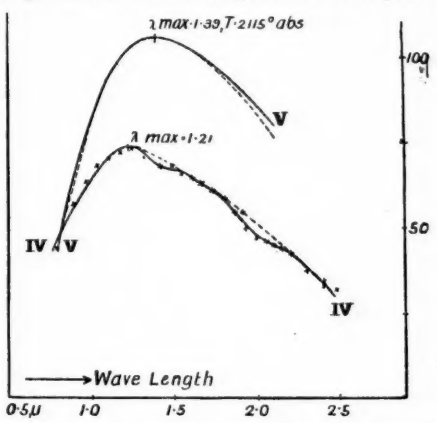
Fig. 2.

through two vessels charged with quicklime to the burner at a pressure of 33·4-10ths.

The results obtained on measuring the emissive power of the Hefner flame are plotted on the curve marked I. in fig. 1, where the ordinates indicate the energy, the full-line abscissæ indicate the wave length, and the dotted abscissæ indicate the displacement. A correction has been made for the small absorption within the quartz prism on the basis that a plate 2·25 c.m. thick gave 4 per cent. more absorption at 1·45 and 2·20 $\mu$ than at 0·8 $\mu$.

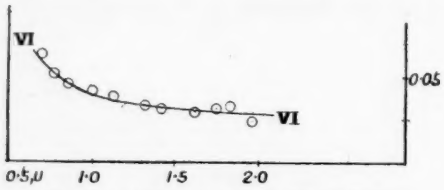
The energy distribution of the Hefner flame has already been determined by Angström, who employed a prism of rock salt. Some of the values he obtained, reduced to the normal spectrum, are represented by crosses on Curve I. in fig. 1. Curve II. in fig. 1 represents the energy distribution of the "black" Hefner flame. Fig. 3 is precisely similar to fig. 1, but relates to the acetylene flame; Curve IV. being that of the normal flame and Curve V. that of the "black" flame. Stewart has already examined the emissive power of the acetylene flame, using a prism of fluorspar; but at the position of maximum radiation (about 1·2 $\mu$) the latter disperses so irregularly that Stewart's results cannot be compared with those obtained by Ladenburg. In the region under examination, only the fainter absorption bands due to the carbon dioxide and the water vapour of the atmosphere are present. In order to eliminate their influence, the curves have been smoothed in the manner shown by the dotted lines in the lower curves of figs. 1 and 3.

The absorptive power of the Hefner flame as obtained from numerous examinations is shown in fig. 2, where the ordinates are the absorption and the abscissæ the wave lengths. Fig. 4 similarly represents the total absorption of the acetylene flame.




IV. Energy Distribution of the Acetylene Flame for Normal Light.
V. " " " "Black" Flame.

Fig. 3.




VI. Total Absorption of the Acetylene Flame.

**Fig. 4.**

On dividing the emissive powers of the flames deduced after smoothing out the atmospheric absorptions by the corresponding absorptive powers, the "black" energy curves already mentioned are obtained—that is to say, the energy curves of bodies which possess unit absorptive power at the temperatures of the incandescent carbon particles in the respective flames. The dotted lines accompanying the "black" curves in each of the two figures show the calculated emissive power of a "black" body whose maximum lies at the same spot; and the satisfactory agreement between the dotted and the full-lines shows the excellence of the method employed. The equation $\lambda \max T = 2940$ represents the temperature of the incandescent carbon in the Hefner flame as being 1678 deg. abs. = 1405 deg. C., and that of the carbon in the acetylene flame as being 2115 deg. abs. = 1842 deg. C.

With the aid of the absorptions, the temperatures of the flames may also be easily and accurately calculated on determining the "black" temperature with the help of the optical pyrometer. If $T_s$ is the "black" temperature of an incandescent body at the wave length $\lambda$, $T_w$ its true temperature, and A its coefficient of absorption, then

$$\frac{1}{T_w} = \frac{1}{T_s} + \frac{\lambda}{c} ln\, A;$$

where $c = 14600$. When a Hefner lamp verified by the Reichsanstalt was employed in conjunction with a red glass having the wave length 0·66 $\mu$, the Hefner light gave an average value of $T_s = 1174$ deg. C., and the acetylene light $T_s = 1388$ deg. C. Neglecting the reflection due to the absorption at 0·66 $\mu$, the absorption curve of the Hefner light gave $A = 0{\cdot}110$, and that of the acetylene flame $A = 0{\cdot}064$. So that, from the equation, the temperature of the former was $T_w = 1694$ deg. abs. = 1421 deg. C., and that of the acetylene was $T_w = 2093$ deg. abs. = 1820 deg. C. Making an allowance for reflection in the Hefner flame of 0·01, and in the acetylene flame of 0·006, the values became

$$T_w = 1704^\circ \text{ abs.} = 1431^\circ \text{ C.}$$

for the Hefner light and

$$T_w = 2111^\circ \text{ abs.} = 1838^\circ \text{ C.}$$

or the acetylene light.

These temperatures agree well with that found by Kurlbaum for the Hefner light (1427° C.) and by Nichols for acetylene (1845° C.), though the latter worked with a thermo-electric process, keeping his thermocouple outside the flame and calculating his results by extrapolation.

## USE OF PITCH FOR MAKING PAVING BLOCKS.

In the manufacture of artificial asphalt, powdered silica is usually compressed with bitumen or pitch. The cementing material is first melted, and then as large a quantity of silica dust as possible is added by hand. At the place where the paving is being laid, the blocks of asphalt are again melted, and as much sand is added as requisite to form a good asphalt. Notwithstanding this, the quantity of the cementing substance is so great that the product is very sensitive to variations of temperature and pressure. To form a true artificial stone having a pitch and silica base in different properties to those of asphalt, it is preferable to make the pitch act directly on the silica.

A mixture of powdered pitch and silica dust, in the proportion of 16 and 84 per cent. respectively, is placed in a semi-cylindrical mechanical mixer, fixed horizontally, and open at the top. This mixer, which is about 16 feet long, and furnished with a helical cast-iron agitator, is stood on a fireplace protected by refractory bricks. The mixture is introduced by means of a bucket elevator. The silica should be half fine dust and half granular, so as to economize the pitch and obtain a maximum density in the product; for the dust fills the interstices left by the grains. The temperature of the mixture is maintained at about 150° C., so that the pitch does not boil, and always remains pasty.

The prepared powder is automatically conveyed from the mixer to a powerful hydraulic press, having a piston about 14 inches in diameter, by small helical shovels working like an endless screw. This press, which has a rotating circular plate 6 ft. 6 in. diameter, contains three moulds, 10 inches square, arranged at an angle of 120° with regard to each other; an accumulator, to increase the speed of pressure; and a hydraulic pump. The plate turns upon its centre round a column of the press. Each mould has a compressing block, and is 6 inches deep. The first mould receives the material, and the second (located under the press piston) reduces the powder to a compressed block about 3 inches thick. The third mould, under the action of an automatic discharger connected with the piston, effects a clearance. When cold, these siliceous blocks resemble dark grey basaltic compressed blocks. If they are laid with joints of pitch, the resulting pavement is practically in one piece.

The foregoing particulars are taken from an article in a recent number of the "Revue des Produits Chimiques," which contains an estimate of the expense of producing the blocks. It is claimed that their cost per square metre is lower than that of other methods of paving, and even of common macadam. It is stated that silica compressed by the system described retains all the qualities of asphalt—viz., a certain malleability and elasticity which prevents crumbling. It will also deaden sound and act as an insulator; while its composition imparts to it considerable disinfecting power. Its specific gravity (2·391) is much greater than that of asphalt (1·366), and slightly less than that of granite (2·716), depending upon the purity of the silica employed and the pressure used. By its hardness and the small percentage of bituminous properties, the pavement is not slippery like asphalt, and it has the good qualities of stone, without being friable under the action of impact or frost. The material can be used for roads, side-walks, laboratories, cellars, waterproof buildings, drains, and terraces.

The parties most interested in this subject are brick and cement makers, who already have the necessary machinery, and tar distillers and asphalt manufacturers, who possess the raw materials. Complete plant for the production of these paving blocks has been fitted up by the Société des Produits du Goudron Portalupi, in Turin, and hand plant has been installed at Vitry.

## A REINFORCED CONCRETE WATER-TOWER.

In reconstructing the water-works for the city of Anaheim, in Southern California, the problem of a structure for an elevated water supply was one that had to be solved—the immediately surrounding country being very level, with no natural reservoir site available. The population supplied is about 3500, and it was necessary to have a storage capacity of 175,000 gallons, with a minimum head of about 60 feet. Tenders were invited upon specifications for an elevated hemispherical-bottom steel tank on steel towers, and for a tank and tower of monolithic reinforced concrete construction. The specifications for the concrete tanks required that bidders must be able to show successful examples of this method of construction. The tenders for steel tanks and towers ranged from $9200 to $12,500; while for the reinforced concrete tank and towers two offers were received—one for $10,400, which was accepted, and the other much higher. The greater durability, the reduced cost of maintenance, and the better appearance led the City Trustees to accept the reinforced concrete structure, the following particulars in regard to which are taken from "Engineering Record."

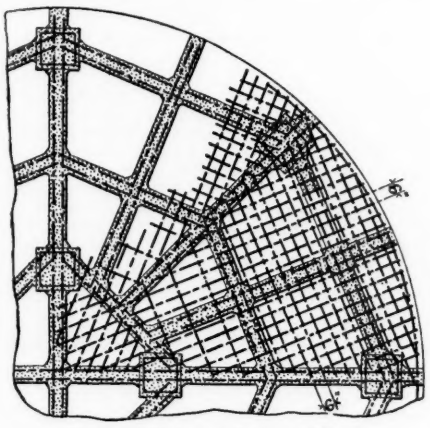
The tank is approximately 30 ft. 3 in. diameter, and has a clear interior depth of 32 feet. It rests on twelve reinforced concrete columns, each 22 inches square and 60 ft. 2 in. long—eight of them being placed at equal distances on the circumference of a 33-feet circle, and the other four on the circumference of a 4 ft. 4 in. circle. The columns are braced by two series of horizontal struts at the third points of their length; but no diagonal bracing in vertical planes is used, as the batter of the columns and the manner in which they are built into the foundation slab and the tank floor are intended to provide for the lack of it. The horizontal struts contribute to the rigidity of the tower, by dividing the columns in effect into three compression members.

The soil at Anaheim is an alluvial deposit underlaid with strata of sand to a depth of 50 feet, and in periods of great rains these strata are said to resemble quicksand. This led to the adoption of a very conservative foundation bearing pressure. Holes sunk near the spot showed that the first stratum of sand was about 8 feet below the surface. The excavation is carried down 6 feet; and in case sand should be encountered at that depth, it is to be removed for 18 inches and replaced by soil or clay.

The reinforcement consists throughout of twisted square steel bars tied together where necessary with ¼-inch round iron. The steel is to have an elastic limit of about 40,000 lbs. per square inch before twisting, and about 60,000 lbs. after twisting, and an ultimate strength of 80,000 lbs. Extra care is required in placing the steel in its proper position, and more especially to prevent any movement of the reinforcement while concrete is being placed. All joints between adjacent continuous rods in tension are to be lapped 12 inches, and bound together by wrapping them with soft steel wire.

The foundation consists of a reinforced concrete slab, 36 inches thick and 37 feet square, extending out beyond the limits of the tower and tank on all sides. It is made of 1 to 3 to 4½ concrete; the crushed rock or gravel varying in size from ¼-inch to 3 inches in the largest dimension, and is reinforced by twisted steel bars placed 2 inches from the underside of the slab. The bottom bars are of ⅞-inch material, 16 inches on centres; and at right angles to them are placed the distribution bars of ¾-inch material, 12 inches on centres. On top of this foundation slab are built the pyramidal pedestals of the columns, which are anchored to the slab by the twisted steel bars running through them, and embedded in

the concrete of the foundation. The columns are reinforced with four ¾-inch twisted bars, one in each corner, tied together with ¼-inch iron wire. When the tank is empty, the assumed wind pressure is sufficient to cause tension in the columns; and the vertical reinforcing in the latter is therefore designed to resist both compression and tension. The ends of adjacent rods are kept in line by being placed in a socket about 12 inches long; and, in order to resist tension, they are joined by a splicing-bar of twisted square steel about 48 inches long, firmly bound to them with soft steel wire. The columns and girders are made of 1 to 2½ to 2½ concrete, using the run of the crusher under ¾ inch for the stone. The struts have a cross-section 14 inches by 16 inches, and are reinforced with four twisted bars of either ½-inch or ⅝-inch material, one being placed in each corner and tied together, as explained for the columns.



**Floor and Girders at Bottom of Tank.**

By far the most complicated part of the reinforcement consists in the beams and girders supporting the floor of the tank. Most of these, which are shown in the accompanying illustration, are 8 inches wide, varying in depth from 12 to 16 inches. The placing of the reinforcement in them does not differ from the standard methods, except that the stirrups of ¼-inch wires are used quite plentifully. The floor of the tank is 6 inches thick, reinforced with ⅝-inch bars arranged with varying centres according to the span; the greater part of them being placed in a right-angled grid on 6-inch centres both ways.

The sides of the tank vary in thickness from 6 inches at the bottom to 4 inches at the top; and, like the floor, they are made of 1 to 2 to 2 concrete, the stone being the run of the crusher under ½-inch. In case the rock should vary to such an extent as to give a more dense concrete if mixed in some other proportion, the amount of sand and rock will be varied accordingly. The reinforcement of the sides consists of ¼-inch twisted steel bars placed vertically on 24-inch centres around the circumference of the tank, running from the floor to the roof, across which, laid horizontally and continuously around the tank as a hoop, are ¾-inch twisted steel bars with centres varying from 3½ to 12 inches. For the lower half of the height of the tank these hoop bars are of ¾-inch steel; for the next 5 feet, ⅝-inch steel; and for the remainder of the height, ½-inch steel. The spacing of the ¾-inch bars varies from 3½ to 7 inches; of the ⅝-inch bars, from 5 to 7 inches; and of the ½-inch bars, from 5 to 12 inches—the smaller spacing, of course, being used in the lower part of the section containing a bar of given size.

The roof is a flat cone, having a rise of only 12 inches, and is carried by eight radial reinforced concrete girders, varying in depth from 9 to 15 inches. The roof is 2 inches thick, reinforced with ¼-inch twisted steel rods laid both radially and perpendicular to the radii; the latter bars reaching between the girders which support the roof. The spacing of the bars laid crosswise of the radial ones varies from 3 inches near the edge of the tank, where the span between the girders is longest, to 12 inches near the centre, where the span is very short. A steel ladder allows access from the ground to the tank.

The waterproofing of the tank is considered the most particular part of the work. Every effort will be made to prevent lack of continuity in the walls due to cessation of work from day to day. The inside of the tank is to receive a waterproofing coat, ½-inch thick, composed of 1 to 1 cement grout. Of the cement used, 96 per cent. must pass a 100-mesh screen, and 82 per cent. a 200-mesh one. The contractors will also use some astringent to aid the waterproofing. The tank is to be kept filled with water for ten days before acceptance, during which time it must not develop any structural weakness nor any objectionable leakage.

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The value of land taken for water-works purposes, according to a decision of the Massachusetts Supreme Judicial Court, is made up of the value of the land, apart from its special adaptability for water-supply purposes, *plus* such sum as a purchaser would add to that value on the chance that the land might be some day used as a water supply.

# REGISTER OF PATENTS.

## Incandescent Mantles and Holders.

WILDBORE, J. E., of Oldham.
No. 17,867; Aug. 9, 1906.

The improvements referred to in this specification consist of the mantles being hardened at the bottom by being dipped in a solution which does not burn when the mantle is lit. It therefore stops mantles from splitting upwards from the bottom, but "does not affect the illuminating power of the mantle in the least." The stand is adjustable and fits on to the burner and supports the mantle from the bottom—an arrangement only possible with hardened mantles.

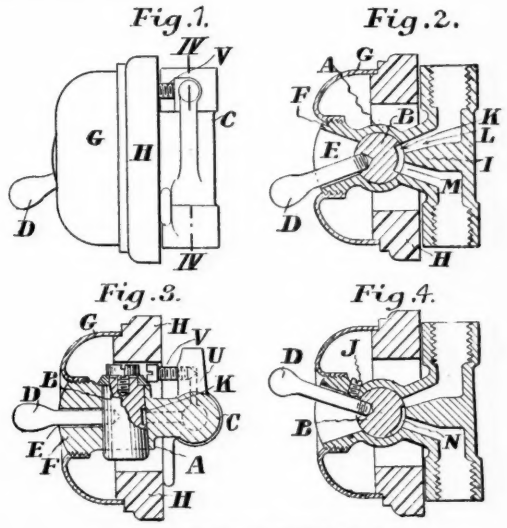
The solution described is a mixture of plumbago, French chalk, and flour, mixed to a paste; but the patentee does not confine himself to this particular method of hardening mantles.

## Gas Cocks or Valves.

GLOVER, T., of Norwich, WAYTE, W. H., of Norwich, and HANDS, G., of Farringdon Road, E.C.
No. 18,625; Aug. 20, 1906.

This invention relates to cocks or valves for operating gas-lights (principally at a distance); the chief object aimed at being to construct a valve or cock for fixing on a gas supply to facilitate the turning on of the full supply to burners, to entirely cut off the supply, or to reduce it to the quantity required for a pilot-burner—all without touching the gas brackets or the like.

The patentees remark: It is well known that the tumbler switch for controlling the flow of an electric current for lighting rooms is most convenient and tends to economy in the use of current—especially when the switch is fixed near the door of a room. A gas valve constructed according to this invention may suitably have the same appearance; is operated in the same way as a tumbler switch; and gives like facilities in the control of gas lights as the switch affords for the control of electric current.




**Glover, Wayte, and Hands' Gas-Cock.**

Fig. 1 is an elevation of a gas-cock constructed according to this invention; fig. 2 is a vertical section; fig. 3 is a plan; and fig. 4 shows in vertical section the valve slightly open when the switch handle is pushed back to its fullest extent so as to allow sufficient gas to pass to supply a pilot-burner.

The longitudinal axis of the barrel A and of the taper plug B are at right angles to the longitudinal axis of the casing C through which the gas is supplied; and the plane in which the axis of the plug lies is parallel to, but at some distance from, the plane in which lies the axis of the casing, and consequently also the axis of the supply pipe, which is in line with it. Thus when the casing is fixed to a wall, the plug is at some distance from it; thus rendering it readily accessible for adjustment and repairs without its being necessary to touch the wall or the rest of the installation. The barrel and casing are made of one casting, and the plug mounted therein is operated by a handle or lever D secured thereto by screwing. The amount of movement allowed to the lever is limited by the size of the slot E in the raised boss F forming part of the barrel of the cock; the boss being also provided with an external thread on to which is screwed a dome-shaped cover G having a central internally threaded sleeve or cylindrical part. The dome-shaped cover while improving the appearance of the cock also serves to retain in position the wooden block or base H.

The casing is screwed internally at each end, to receive the gas-pipes. It is provided at about the middle with a perpendicular wall I which extends as far as the plug, so as to make joint therewith; and the latter has a gas-way in the form of a slot K adapted to register with the ports L and M in the casing. There is a passage or bye-pass U, with a regulating screw V so as to admit enough gas to light a pilot-burner; the supply to the main burner being closed by a valve in or near the burner operating automatically when the pressure of the gas thereto is materially decreased.

It is to be understood that a valve or cock which permits of a sufficient amount of gas passing even when the plug is closed is well known, and that this figure only shows how a valve constructed according to this invention may be adapted for use with a burner provided with a pilot-burner, and having a valve which closes the supply to the burner automatically when the area of the passage of the gas through the cock, and consequently the pressure of the gas in the pipe from the cock to the burner, is considerably reduced.

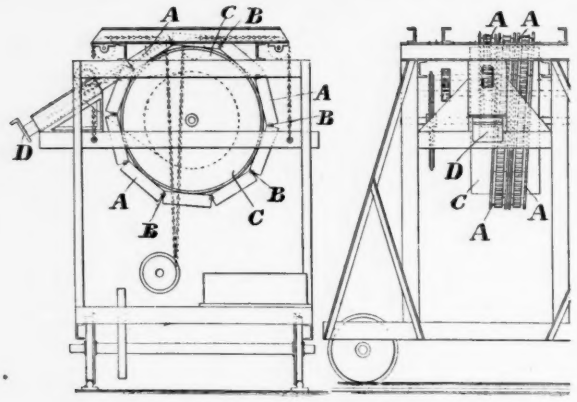
The construction shown in fig. 4 is similar to that described except that the recess or slot N in the plug B is open to a slight extent (even when the lever is pushed back), so as to allow just enough gas to pass to supply the pilot-burner—the amount of opening of the plug when in its closed position being regulated by a set-screw J.

## Discharger for Gas-Retorts.

LUDBROOK, S. W., of Hornchurch, Essex, and COLE, W. L., of Burdett Road, Bow.

No. 20,325; Sept. 12, 1906.

This invention relates to the class of gas-retort discharger described in patent No. 14,980 of 1905, in which the discharger rod or pusher bar is made in two sections, jointed together end-on; the present proposal being to construct the pusher rod or bar from a number of sections hinged together, so that they can "be wrapped around a drum or coiled in the apparatus carrying same to economize space."




**Ludbrook and Cole's Retort Discharger.**

The illustrations show a side elevation of a portion of a framework carrying the present construction of discharge rod, and a front elevation.

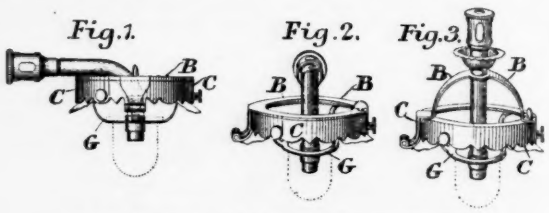
As shown, the pusher bar is made from a number of sections A, jointed together end-on at B; and such sections when not formed up in a straight line to constitute the pusher rod are wrapped around a drum C. But the sections can, it is pointed out, be coiled or conducted in any other manner to effect the same object. D is the pusher-head, which, with the bar, is passed into the retort to eject the coke.

## Inverted Incandescent Gas-Burners.

BOOTH, J., TOPPING, R., and SIMPSON, R. J., all of Birmingham.

No. 25,794; Nov. 15, 1906.

These improvements have for their object to facilitate the replacing of mantles on the burners when required, without any waiting for the parts of the burner to cool, and thus obviating waste of time. The burner is made with a fixed gallery and also with a hinged globe-carrying ring, as shown.




**Booth, Topping, and Simpson's Inverted Burners.**

Fig. 1 represents in side elevation, and fig. 2 in front elevation, an inverted incandescent gas-burner (provided with the improvements) for connection with fittings which project horizontally. Fig. 3 represents the improvements applied to burners which depend vertically from the gas-fitting.

The hinged globe-carrying gallery C in figs. 1 and 2 is retained in its normal or raised position by a swivelling stud or turn button carried by the gallery passing through a slot in the fixed gallery B and being so turned that its head crosses the slot. In fig. 3, the vertical burner-tube has fixed to it a crossing-strap or bar B, to part of which the globe-carrying gallery C is hinged; the other half having the slot for the swivelling stud or turn button on the gallery to engage with.

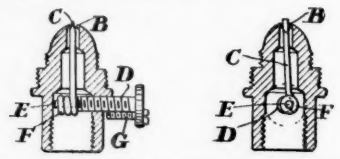
The mantle may be supported either on the ring G attached to the globe-carrying gallery or on the ordinary mantle support on the end of the burner.

## Regulator for Incandescent Burners.

HARWOOD, B. E., of Finsbury Park, N.

No. 28,033; Dec. 8, 1906.

This invention relates to the combination with the gas-nozzle of an atmospheric burner for incandescent gas lighting of a pin valve having a tapered or inclined end which is inserted into the orifice of the nozzle, while an eye is formed at the inner end of the pin-valve and an eccentric pin engages with the eye.




**Harwood's Regulator for Incandescent Burners.**

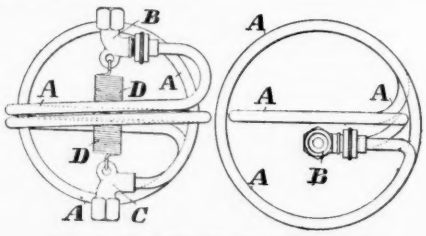
The nozzle proper has in it a hole B through which the gas enters the mixing chamber of the burner which is screwed on to the nozzle. C is the pin-valve arranged inside the nozzle and inserted into B—the outer end of the pin-valve being made tapering or inclined, so that its longitudinal movement in the hole will serve for contracting or increasing the area of the gas passage. D is a screw provided at one end with an eccentric pin E which enters an eye F formed at the inner end of the pin-valve. By rotating this screw in one or the other direction, the valve is moved longitudinally to the required extent for regulating the gas supply. In order to prevent the screw from being rotated out of engagement with the pin-valve, a stop G is inserted through the head of the screw and impinges against the underside of a shoulder formed on the exterior of the nozzle.

## Anti-Vibration Appliances for Gas-Lamps.

GLOVER, T., of Queen Victoria Street, E.C.

No. 29,573; Dec. 28, 1906.

This invention relates to an anti-vibration device which consists of a coil of piping having the connections for the gas supply-pipe and the burner at the ends, as shown.




**Glover's Anti-Vibration Gas-Lamp Device.**

The copper or other tube A with its connections B C, join up the supply pipe and burner. The pipe A has as many coils as desirable, at an angle to each other, so that the vibration of the burner is taken up by the coil in any position of the burner.

Some coils may be vertical, others horizontal (as shown), while others may be at an angle. But it is preferable, says the patentee, that each coil should be on a different axis, but from one imaginary centre; and the coils may be of different sizes, and some arranged within the others.

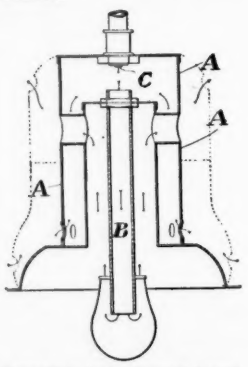
The attachments B C on the ends of the pipe A are connected by a helical spring D passing through the coils, so as to support the weight of the lamp.

## Incandescent Gas-Lamps.

TWEEDIE, R. O., of Galashiels, N.B.

No. 1235; Jan. 17, 1907.

This invention relates to incandescent gas-lamps of the kind wherein the air heated in an enclosed chamber by the waste gases, and so raised to a certain degree of compression, is led into a bunsen burner tube carrying an inverted mantle.




**Tweedie's Incandescent Lamp.**

The bunsen tube B receives its gas supply from a nozzle C. Depending from the gas-pipe, and concentric with the tube B, is the air-heating chamber A, which extends from the nozzle C to the level of the upper end of the reflector E—surrounding the upper major portion of the tube B. Surrounding B, and enclosed by the chamber A, is a flue for

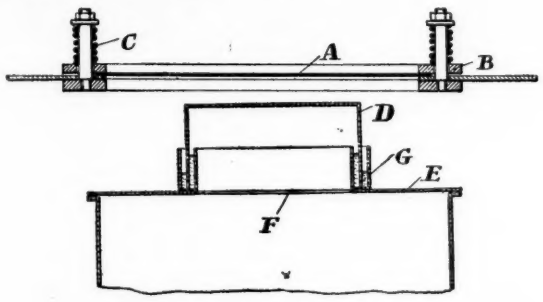
the waste gases, extending from the base of the chamber A almost to the level of the upper end of the tube B. The air-heating chamber is closed at both its upper and lower ends, and the flue is closed at its upper end; while between the upper end of the flue and the upper end of the chamber A is a space "of considerable dimensions" into which opens the upper end of the tube B. The air is admitted to the chamber A through orifices at the lower end fitted with the usual hit-and-miss governor, and outlets are provided at the upper end for the escape of the products of combustion from the flue.

## Safety Devices for Use in Purifiers.

MÜNZEL, M., of Brunswick, Germany.

No. 10,752; May 8, 1907.

The purifiers which are used in suction gas apparatus cannot (the patentee remarks), in consequence of their large dimensions except at a comparatively high cost, be constructed sufficiently strong to withstand with safety explosions of oxyhydrogen gas. The safety devices hitherto employed to prevent the formation of too high explosion pressures have, it is said, considerable drawbacks—water seals by reason of their comparatively large water mass having too great inertia, so that under certain circumstances the full explosion pressure may already be developed before the water is ejected; while valves of the usual construction are also too heavy if they are to remain permanently tight, and have the necessary size. The patentee therefore proposes to overcome these difficulties by arranging a spring-pressed plate or disc on the purifier of comparatively small dimensions, or a water-sealed bell of much smaller dimensions.




**Munzel's Purifier Safety Seal Device.**

A thin plate A of sheet iron, sheet lead, pasteboard, indiarubber (with or without canvas insertion), mica or other suitable material is pressed by a ring B and springs C against the cover of the purifier. "In the event of an explosion, according to its suddenness and the rigidity of the plate A, the latter, together with the ring B, will lift like a safety valve, or will bend into a spherical dished shape and fly out. In any case only a comparatively small mass has to be set in motion." According to the material of which the plate is composed, it may either itself serve as packing or packing material must be placed beneath it.

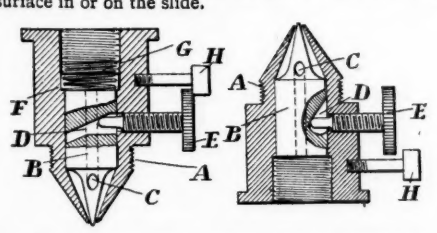
In the alternative form of construction, an aperture F formed in the upper cover E of the purifier is surrounded by an annular channel G. A bell D in this channel is filled with water or other fluid; and in combination with the liquid hermetically shuts off the interior of the purifier from the outside. "As during the regular working there is a low pressure in the purifier, the liquid in the channel G stands higher inside the bell than outside; but if an explosion takes place the liquid from the channel G is ejected to the outside, or the bell is raised or entirely blown off according to the strength of the explosion."

## Adjustable Jets for Air-Gas Burners.

BRETT, C. G., and HENNEBERGER, F., of Tooting, Surrey.

No. 12,153; May 25, 1907.

In this air-gas burner the passage through the jet is controlled by a slide movable in one direction by its weight or by a spring, and in the opposite direction by turning a screw the end of which bears against an inclined surface in or on the slide.




**Brett and Henneberger's Adjustable Gas-Burner Jets.**

The illustration shows a vertical section of a jet suitable for an upright burner and one for an inverted burner.

In the former, the cylindrical jet A is internally coned at its upper end; the orifice of the jet being at the apex of the cone. Having a sliding fit in the cylindrical portion of the jet is a cylindrical plug B, also coned at its upper end—the angle of the cone being somewhat smaller than that of the internal cone of the jet, so that the sharply-pointed apex of the cone can protrude through the orifice of the jet, and leave a chamber between the coned end of the internal slide and the cone of the jet. The plug has longitudinal perforations C and a lateral cavity or transverse hole D, the upper surface of which slopes downwards towards the axis of the cone. The plug is inserted into the jet so that the cavity D is opposite to the end of a screw E working through the wall of the jet. When this screw is turned so as to make its end protrude farther into the jet, the end rides against the inclined surface of the cavity D, and lifts the plug to close more or less completely the jet orifice; while when it is turned in the opposite direction the screw allows the plug to slide downwards to open the orifice more or less. Where the jet is exposed to much dirt, a spiral spring may be introduced between the cone of the plug and the internal cone of the jet, so as to aid the weight of the plug in opening the orifice.

In the inverted arrangement, a spring F, having this function of aiding the weight of the plug, is shown applied between the flat end of the plug and a ring G screwed into the jet. In this case, the plug moves under the action of its weight to close the orifice of the jet—the spring only being used when this weight is likely to be insufficient to overcome any depcsit in the jet.

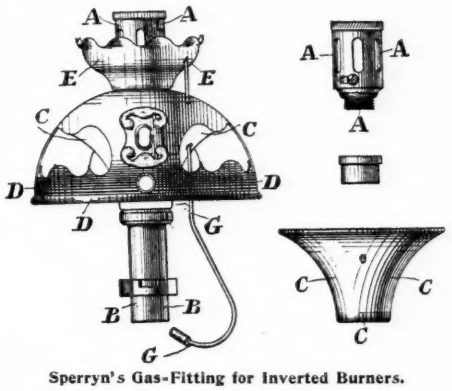
In order that the manipulator may not withdraw the screw far enough for it to become disengaged from the cavity D, a pin H is fixed in the wall of the jet so that its head limits the movement of the head of the screw.

## Gas-Fittings.

SPERRYN, G. N., and SPERRYN AND COMPANY, LIMITED, of Birmingham.

No. 12,716; June 1, 1907.

This invention refers to fittings used for inverted burners—to obviate the trouble experienced owing to heating of the parts of the fitting above, and in the neighbourhood of, the burner.




**Sperryn's Gas-Fitting for Inverted Burners.**

A is the usual mixing-chamber having an internally threaded upper end for connection to a gas-pipe; B is the burner of refractory material; C is the heat deflector; D is an ornamental cover for it; and E is an ornamental shield arranged on the cover and serving to further protect the mixing-chamber. This china or other deflector C is made separate from the burner, and so that it can be readily arranged in position or removed from same. For this purpose, the burner has a lip at the top, over which is spun a metal cap having an upturned flange for carrying a thread. Into the metal cap the tube F is threaded and forms part of the burner-tube. The deflector is slipped over the tube, taking a seating on the covered lip of the burner. The upper end of the tube is then screwed into a hollow nut, and the cover is slipped in position with also the shield E. The mixing-chamber is then screwed home into the nut—securing the fitting properly together. When a bye-pass G is used, it projects through perforations in the shield E and cover D.

## APPLICATIONS FOR LETTERS PATENT.

19,113.—PENDLEBURY, H. A., "Conduits for gas and water." Aug. 26.

19,173.—MILBOURNE, R. J., "Discharging purifiers." Aug. 26.

19,201.—HELPS, G., "Bunsen burners." Aug. 27.

19,202.—HELPS, G., "Lamps and burners." Aug. 27.

19,228.—WOLTERECK, H. C., "Removal of tarry matter from hot gases." Aug. 27.

19,278.—ALTMAN, J., "Inverted burners." Aug. 27.

19,283.—STEINICKE, G., "Inverted gas-lamps." Aug. 27.

19,287.—BLEICHERT, M. A. & P. M., "Quenching and transporting coke." Aug. 27.

19,298.—DUBOIS, F., and HAMLYN, S. W., "Controlling the flow of gas in connection with gas lighting." Aug. 28.

19,329.—ARKINSTALL, D. & F., "Acetylene generators." Aug. 28.

19,341.—HUMPHREY, H. A., "Raising or forcing liquids." Aug. 28.

19,356.—M'MULLEN, J. A., "Gas-engines." Aug. 28.

19,377.—CLARKSON, J. M., "Gas cooking-stoves." Aug. 29.

19,478.—SUGG, W., & Co., LTD., and WRIGHT, E. SUGG, "Street gas-lanterns." Aug. 30.

19,530.—ASSMANN, F., and STETTIN GASWERKE, G. M. B. H., "Air-gas apparatus." Aug. 31.

19,555.—COLE, H., "Incandescent burners," Aug. 31.

**Altrincham District Council and the Gas and Electricity Supply.**—The Altrincham District Council have decided to convene a conference of representatives of the Councils of Altrincham, Bowdon, and Hale, for the purpose of drawing up a scheme for the acquisition of the undertakings of the Altrincham Gas Company and the Altrincham Electric Supply Company, Limited, on the basis of a joint and mutual ownership and the creation of a Joint Board of Management. It is stated that the price at which the Gas Company's undertaking was offered to the Council three years ago was £187,000—that fixed by the Directors of the Electric Supply Company being £99,000.

# CORRESPONDENCE.

[*We are not responsible for opinions expressed by Correspondents.*]

## The Gas Heating Business Field.

SIR,—Though somewhat averse to utilizing your correspondence columns in a general way, I venture to make a few comments by way of response to your invitation on the above subject. Your editorial in the "JOURNAL" of the 3rd inst. is most timely, and should serve as a further rallying cry to the solution of a problem that has certainly been of a somewhat elusive nature up to the present. I speak in general terms; but there may be exceptions, and such will doubtless come forth and assist in the general solution.

The gas heating business, apart perhaps from cooking, undoubtedly requires separate treatment. In a paper read by myself before the Eastern Counties Gas Managers' Association on April 13, 1905, at Leighton Buzzard, entitled the "Commercial Aspect of Technical Societies,"* I referred, among other subjects, to this very question. Possibly I may be permitted to quote from my prefatory remarks thereon, as follows:—

> Our prime product must be considered more as a means to an end than an end in itself. Our unit is transposed from a given quantity of gas to the energy contained therein as expressed in light, heat, and power; and so long as either of them continues to bring grist to the mill, it must be placed upon the market at prices suited to its (the market's) requirements; each of these uses of gas being treated as a *separate* and *distinct field* for exploitation. Each of these fields has separate and distinct standards of comparison; and, moreover, the varying applications of gas in any one of these fields may again require different treatment.

And again—

> If these sources of gas consumption can be developed in any quantity, it is business that we cannot afford to overlook, and that will prove well worth the cultivation. Still, speaking generally, the development of the gas-fire business has not been undertaken in anything like the same spirit as the cooker business; and those who have given the matter much attention would appear to agree that some special inducements must be offered if this particular field is to be thoroughly exploited.

As a stimulus to exploitation, your startling estimate of the extent of this field of business is of sufficient magnitude to urge us to every effort in its cultivation.

The executive of the undertaking with which I am most intimately connected were some little time before they gauged the conditions of supply of cookers that rendered these acceptable to their customers. But since then the demand has progressed by leaps and bounds; and we appear to be passing through similar stages in the provision and use of gas-fires. Generally speaking, we have failed, so far, to appreciate fully the requirements and different bearings of the gas-fire question; and I must confess to being one of those who have not yet practically met the public want in this respect, though I believe we are on the road to so doing. But the fact remains that, in our own case, while cookers have gone out by hundreds, fires have dribbled out by tens; whereas, if this branch was fully developed, the ratio would be in an inverse direction. Some nine or ten years ago, we in Grantham adopted the system of the sale of gas-fires fixed free with piping up to 30 feet per fire; the complete installation being charged at the list-price of the fire, less liberal discount, and the price of gas remaining the same as for other purposes. After some seven to eight years, an inventory disclosed the fact that the total number of gas-fires in the town was 140 only; while the cookers put out on hire practically during the same period totalled some 2000, among 3300 consumers.

As disclosed in the paper already alluded to, I recognized in the discount meter the most suitable means yet devised for popularizing the gas-fire at the minimum of expense. But the transition from simple sale to simple hire *plus* discount on the gas used, was too radical a step for a Lincolnshire market town; and for the time it was decided to try the effect of simple hire. We restricted this to certain specified fires—any others beyond the list to be supplied either on hire for an agreed minimum period of (say) three years, hire-purchase over five years, or simple sale. The price of gas still remained the same as for lighting purposes, &c. Twenty months' experience of the latter system has resulted in 124 fires being hired, and 8 sold outright; the comparative numbers of consumers, cookers, and fires being at date as under:—

| | |
|---|---|
| Total consumers | 4000 |
| ,, cookers | 2230 |
| ,, fires | 272 |

Clearly, though simple hire has achieved about as much in twenty months as simple sale did in eight years, something more remains to be done to complete the popularizing of fires, even to the numerical extent of cookers; whereas in reality the number of fires in use should be far in excess of that of cookers. I am glad to find that our views coincide on such a momentous matter; for I am more firmly convinced than ever that this lode will not be struck until we adopt some such system of preferential treatment as that provided by the discount meter in conjunction with an acceptable hiring system.

Here, again, the fire business requires different treatment from that of cookers; for whereas quarterly renting of cookers is generally found satisfactory, it is advisable, for obvious reasons, to charge gas-fire rents half yearly, and preferably payable in advance—say, March and September. In our own case, the rent is a sum equal to 15 per cent. per annum on the average net cost of the fire fixed complete. Two-thirds of this is devoted to depreciation, and one-third to interest. The fires are visited once a year, in the autumn, for inspection, and also cleaning and repairs, if necessary.

Your arguments are quite in accord with my own views, and, I believe, the views of many others; but what is wanted is a deeper study of the question by all interested parties, from which alone successful action is sure to spring. My main object in writing thus is to urge upon the Commercial Sections of our District Associations the necessity of giving this question their immediate attention, to the end that a good fillip may be given to the gas-heating business while solid fuels are at a comparatively high figure. Once that stage understood as "popular" is attained, the remainder is easy-going.

*Grantham, Sept. 7, 1907.* R. G. SHADBOLT.

* See "JOURNAL," Vol. XC., p. 158.

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SIR,—Reading your "Editorial" of last Tuesday on the above subject led to the reflection that, had the discovery of the utility of gas for heating purposes been made a hundred years ago, and had its use for illuminating purposes only dawned upon the world some fifty years later, what a wonderfully different aspect the gas industry would have borne to-day. There would have been no quibbling on the question of differential prices; the capital outlay in the manufacture of gas for heating purposes would have been so much less per volume made than that which would have been found requisite fifty years afterwards to meet a demand for lighting, that a differential price would at once have been established, and, wonderful as has been the expansion in the coal gas industry, it is small in comparison with what it would have been. As foreshadowed in your article, there is a scope in domestic heating alone for fully four times the amount of gas at present used for all other purposes; and the selling of gas at a cheaper price for uses other than lighting would not only satisfy prospective consumers, but would increase the profits of the gas undertakings to such an extent as would enable them, without a shadow of doubt, very shortly to give a further reduction both to lighting and heating gas.

That this matter may have the attention which it deserves, and that the same energy may be devoted to the heating gas business as has been given to the "Penny-in-the-Slot" business, is my earnest hope—not simply from the point of view of expansion of business or increase of profit, but also from a belief that it will make life more comfortable in our large cities, which after all is perhaps the ideal that municipal gas undertakings, at least, should most aim to attain for their constituents.

*Mawson Chambers, Manchester, Sept. 5, 1907.* THOS. G. MARSH.

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SIR,—Your article under the above heading reminds me that I received, along with my balance-sheet from the Croydon Gas Company, a reprint of a lecture delivered by Professor Lewes at Croydon, in which he draws the parallel between the cost of coal and the cost of gas for heating purposes. Now this seems to be a very practicable way of looking at the matter, and I feel sure that any information your correspondents can give in this direction would be very valuable, and will indirectly help to stiffen the price of gas companies' shares.

*Sept. 6, 1907.* SHAREHOLDER.

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SIR,—We have had the differential price system in use for a considerable time, and are well satisfied that the system is a thoroughly business-like one. We have been much surprised that it has not been more generally adopted, but feel sure that your article will give the necessary encouragement to those who have been long sitting on the fence. From our experience I am certain that the gas community will be much indebted to you for your timely article.

*Sept. 6, 1907.* SECRETARY.

[Our correspondents are heartily thanked for their letters on the subject treated upon in our first editorial article last week; and it is hoped that their example will be followed by many others. It is a subject that it is opportune to thresh out well; and the more minds that are set to work upon it, and the wider the discussion, the better. Our correspondents have given additional pegs to those in our article upon which to hang discussion; and our columns are open freely to all who wish to subscribe views or suggestions.—ED. J.G.L.]

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**Increase in the Price of Gas at Plymouth.**—The price of gas in Plymouth and Stonehouse is to be increased next quarter by 2d. per 1000 cubic feet. In making the announcement, the Company say that the increase is rendered necessary by the great advance in the price of coal. The present charge is 1s. 9d. per 1000 cubic feet; gas for motive power being sold at 1s. 6d.

**Exmouth Water Supply.**—Reference was made at a meeting of the Exmouth District Council last Wednesday to certain correspondence which had been going on as to the water supply, and which was being considered by the Gas and Water Committee. The letters were not read; but a summary of them has been published which shows that they relate to difficulties which have arisen over an effort to obtain an additional supply of water. As the quantity of water in the reservoirs was running low, it was suggested that it should be supplemented by pumping water from the Yettington Brook at East Budleigh. This stream, however, works a mill; and the owner of the mill at once threatened the Council with an action if any water was abstracted to his detriment. In the course of the correspondence which ensued, the Council offered to submit to arbitration the question of any damage which might be done to the mill, while the owner offered to sell to the Council his interest in it. New filter-beds are about to be constructed, and will be completed before next summer; but it will apparently be necessary for the Council to take steps to supplement the present supply. At the meeting last Wednesday, they considered tenders for the works which had been decided upon, comprising the construction of filter-beds, service reservoir, meter-house, and pipe-line, the Surveyor's estimate for which was £3392. The lowest tender was that of Messrs. Hardy, Bate, and Co., for £2747; and this the Council decided to accept. The tender of £1410 of the Sheepbridge Iron Company was also accepted for pipes; and that of Messrs. Blakeborough and Sons, of £259 for valves.

# LEGAL INTELLIGENCE.

## An Intemperate Foreman and a Considerate Company.

At the Kidderminster Borough Sessions, a few days ago, Alexander Scott, foreman stoker, sued the Kidderminster Gas Company for the non-payment of £1 18s. for a week's wages in lieu of notice; and the Company summoned Scott for breach of contract. In support of the first summons, it was stated that Scott was sent home by the Manager (Mr. A. Dougall) for misconduct about 11.45 p.m. on the 17th ult.; and that though he wrote a letter saying he was ashamed of himself, and asking to be given another chance for the sake of his wife and family, he subsequently said he expected a week's wages or a week's notice. In cross-examination, Scott admitted that on the night in question he had the entire charge of the gas-works, and was under the influence of drink. In support of the Gas Company's summons, Isaiah Hollerton, engine driver, said he heard two men quarrelling in the retort-house. Scott was not on the works, and he sent into the town for him, as there was no one in charge. Witness also sent for the yard foreman, as six men were idle for two hours. George Cartwright, yard foreman, said he was sent for to the works about ten o'clock, and found that a "draw" had been omitted since eight o'clock. He re-started the men, and Scott returned to the works shortly after eleven. He was then under the influence of drink, and witness persuaded him to go home. Mr. A. Dougall, the Manager, said Scott had no right to leave during the night, as he was responsible for the whole of the works. In his absence there was a deficiency in the make of gas to the extent of 36,000 cubic feet. When Scott returned, he was altogether unfit to superintend the works. Mr. Thursfield, on behalf of the Company, submitted that Mr. Dougall was justified in discharging the man without notice. The Bench said the case against the Company would be dismissed. Mr. Thursfield said under these circumstances he would, with the consent of the Bench, withdraw the summons against Scott; and he did not ask for any costs.

## Stealing from Slot Meters at the East End.

At the Old Street Police Court on Friday, Alfred Lawson, a tailors, presser, with no fixed abode, was charged on remand with stealing money from gas-meters belonging to the Commercial Gas Company. Mr. G. H. Young prosecuted; and his statement and the evidence adduced showed that the prisoner was in the habit of going to tenement houses in the neighbourhood of Mile End, and representing that he was sent to examine the gas-meter. He invariably chose a time when only women were about, and was unsuspectingly shown the meter, which he at once proceeded to open and otherwise tamper with. On the 27th of August, he called upon a Mrs. Simons, at No. 91, New Road, and stole 5s. 8d. from the money-box of the slot meter. On the 30th, he did the same at the tenement of a Mrs. Davis, No. 48, Spital Street, Mile End, and got 3s. 4d. Later on the same day he presented himself to Mrs. Fishman, at No. 12, Pelham Street, and at his request was shown the meter, which he opened. Mrs. Fishman, however, appeared to entertain some suspicion, and did not leave him. Presently he remarked that the meter drawer was broken, and he would have to go and get tools to mend it. She remarked that he ought to have his bag if he came from the Gas Company. He said his mate had it next door; and he tried to leave, at the same time offering her 1d. As he went down the stairs, she called to a neighbour; and this led to the prisoner being stopped. He then took 1s. 10d. in coppers from his pocket, and begged to be allowed to go. He pleaded guilty; and Mr. Biron sentenced him to six months' hard labour.

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**The Wolstanton Gas Arbitration.**—At the meeting of the Gas Committee of the Wolstanton Urban District Council last Tuesday, the Clerk reported that he had taken up the award of the Umpire (Mr. A. J. Ram, K.C.) in the arbitration with the Burslem Corporation—see *ante*, p. 454. The award, it may be remembered, was made in the form of a special case, which will come before the Courts after the Long Vacation. The Clerk reported that the Newcastle (Staffs.) Corporation had declined to accept the offer of the Wolstanton Council for the purchase of their mains, pipes, and fittings, and had given notice of the appointment of Mr. W. A. Valon as their Arbitrator.

**Gosport Water Company.**—At the half-yearly meeting of the Gosport Water Company last Wednesday, it was reported that the revenue for the six months ending June 30 had been £4305, compared with £4387 in the corresponding period of the previous year. The sum of £2362 was carried to the profit and loss account, bringing it up to £7049. Dividends of 3½, 4½, and 5 per cent. on the various descriptions of stock were declared. It was stated that the contracts for the covered service reservoir at Shedfield and for the duplication of the pumping machinery at Soberton were approaching completion, and it was hoped that during the present year the plant would be in full working order. Since March, the district had been partially supplied from the new source, and the water had been found to be of the purest character.

**Indisposition of Mr. Timmins, of Wigan.**—When moving the confirmation of the Gas Committee's minutes at the last meeting of the Wigan Town Council, Alderman Holmes said the great advance in the price of coal (on an average 2s. 6d. per ton) meant an increased cost to the town over last year of £5000. It looked very serious, especially when they had contracted for one of their residuals, tar, some three months ago, at last year's price. The hopeful points were, first, the increased amount of gas consumed by the public, which up to the present time, from April 1, was over 7 million cubic feet; and, secondly, the price of coke must of necessity follow that of coal. Their Engineer, Mr. J. Timmins, he regretted to say, was somewhat out of health; and the doctor insisted that he must leave his work, and go for a change of air, which would doubtless improve him. The Gas Committee, in their wisdom, thought fit to grant Mr. Timmins an additional holiday; and he was pleased to be able to say that he was now gradually, but slowly, improving in health.

# MISCELLANEOUS NEWS.

## SHEFFIELD UNITED GASLIGHT COMPANY.

### Increased Revenue—Export Coal Tax Question.

The One-Hundred-and-Fifth Ordinary General Meeting of this Company was held last Tuesday—under the presidency of Mr. WILSON MAPPIN, J.P., the Deputy-Chairman.

The CHAIRMAN, in moving the adoption of the report and balance-sheet (which were noticed in the "JOURNAL" for the 20th ult., p. 524), commented on the increased sale of gas during the past half year, which amounted to 9·33 per cent. He said he thought they could regard this as extremely satisfactory, seeing that it came on the top of an increase of 7·21 per cent. in the corresponding six months of 1906. This extension in the use of gas showed that the public of Sheffield appreciated the very low price at which the Company were able to supply it; and it was not surprising that this was so, when they considered that an incandescent gas-burner giving a light of from 50 to 60 candles could be used for sixteen hours for 1d. When this was compared with the ordinary electric bulb, which only gave from 12 to 16 candles illumination for four hours for 1d., it would be seen that gas had nothing to fear from competition in this direction—more especially as the light emitted from an incandescent gas-burner was particularly agreeable to read by, and was far less trying to the eyesight than an electric bulb. The quality of the gas supplied had been fully maintained. The average of 1135 tests made during the half year by the Company's officials and the Corporation gas-tester had been 17·4 candles. The total quantity of gas sold was 1,567,285,000 cubic feet; and to produce this 154,871 tons of coal were carbonized—an increase of 10,094 tons over the corresponding period of last year. The extra cost of coal had been £6677. The stokers' wages were also more by £1508; and repairing and re-fixing meters cost more by £484. Repairs of works were £4048 less. This was partly accounted for by the sale of old materials, for which they had received £2293, which was credited to this account; the Company having taken advantage of the high prices which had been obtainable for old iron, &c. Repairs of mains and services had been £637 less, and rates £313 less, due to the district rate having been 2s. in the pound, instead of 2s. 2d. On the other side of the account, the revenue from gas, though the price had been 1d. per 1000 cubic feet less, showed an increase, due to the extra consumption, of £2669. Meter-rents and stove-hire were more by £427, coke by £5523, sulphate of ammonia by £762, and earnings of the Company's railway waggons by £114. Tar had yielded less by £217. Forty additional gas-engines had been fixed during the half year, varying in size from ½ to 500 H.P.; their total horse power being 1536½. The quantity of gas used by engines during the past twelve months had been 293,775,800 cubic feet, an increase of 38,963,000 cubic feet, or 15·3 per cent. This indicated that the Company's business in this direction also was progressing favourably. Also 560 gas-fires, 904 heating and other stoves, and 8044 incandescent burners had been sold during the six months, and 222 additional cooking-stoves were let on hire. They would notice that the sum of £5019 had been written off reserve fund investments, to allow for the depreciation in their value. In taking this step, the Directors were following the example of all the large banks and some of the principal gas undertakings in the kingdom. The matter was carefully considered by the Board; and after consultation with the Auditor, the Directors decided that, having regard to the general depreciation which had taken place during the past few years in all high-class securities. and the fact that there did not appear to be any immediate prospect of their recovering, it was the right course to adopt. The net result of the half-year's working was that, after paying the dividend, there would be £2440 to add to the balance carried forward, which would then be £98,234. It was considered by some people to be rather a bold action on the part of the Company to reduce the price of gas from the commencement of last April, having regard to the rising prices of coal and other materials; but the Directors felt they might safely take this step, as they had in the balance referred to a sufficient guarantee that they would be able to maintain this price, at all events during the next twelve months, after which it was possible there would be a reduction on the high prices now ruling, as past experience showed that these trade booms did not last for more than a year or two. They would have seen numerous statements giving reasons for coal being so dear at the present time. He only hoped that the high price of house coal would cause the public to reflect as to whether the Government were acting wisely in allowing such large quantities of all descriptions to be exported without the payment of duty. Cheap fuel was of vital importance to the manufacturers of this country; and the enormous exportation was undoubtedly the cause of the large advance in prices. The duty, besides having a tendency to check the outflow of coal, would have provided the Chancellor of the Exchequer with the nucleus of a fund for old-age pensions, which he had so much difficulty in procuring. Incandescent gas seemed to be more and more favoured by local authorities for street lighting. The latest example was a report by a Special Committee appointed by the Islington Borough Council (who were themselves suppliers of the electric current) to consider a scheme for replacing gas by electricity in 7 miles of streets. In their report against the proposal, the Committee said that the streets affected by the scheme were well lit by incandescent gas, and no case had been made out for the use of a more expensive illuminant, and that the adoption of the scheme would prevent the possibility in the future of any appreciable reduction in the lighting rate, which it was admitted had been excessive. The Committee were therefore of opinion that the scheme should not be further proceeded with. If this was the case at Islington, the conclusion arrived at would apply with much greater force to Sheffield, where the price of gas was less than half that charged at Islington. There was a special matter to which he desired to direct the attention of the shareholders. There had recently been attempts made to float some new Gas Companies; and Syndicates in London had written to Solicitors and others residing in Sheffield to apply to this Company for a list of their shareholders, in order that they might send prospectuses to them. The plan of the promoters of

these new Companies was to buy for a small sum a gas-works in some out-of-the-way village, re-christen it, and then endeavour to sell it to the public at an amount many times its value. Such over-capitalized concerns could not pay; and it was to be hoped that if any of their shareholders received prospectuses, they would speedily consign them to the waste-paper basket. So far these people had not succeeded in obtaining the addresses of the shareholders, as the gentleman through whom the application had been made had, after an interview with the General Manager (Mr. Hanbury Thomas), declined to render them any assistance. He had, however, considered it his duty to mention the subject, in order that the Company's shareholders at all events might be on their guard, and not be deluded by visions of dividends which could not possibly be earned.

Mr. H. K. STEPHENSON seconded the motion, which was carried unanimously.

On the proposition of the CHAIRMAN, seconded by Mr. B. G. WOOD, the usual dividends were declared.

Mr. RICHARDSON moved the re-election of Sir Frederick Thorpe Mappin as a Director of the Company, and expressed his regret that Sir Frederick was unable to be present at the meeting. Mr. MIDDLETON seconded; and the resolution received the hearty assent of the shareholders. Mr. T. H. Waterhouse and Mr. J. D. Webster were also re-elected Directors.

A vote of thanks to the Chairman, Directors, and officials of the Company concluded the business.

## AUSTRALIAN GASLIGHT COMPANY.

### Seventy Years' Progress.

The Annual Meeting of this Company was held at the Royal Exchange, Sydney (N.S.W.), on Monday, the 29th of July—Mr. G. J. Cohen, the Chairman of the Company, presiding.

The SECRETARY (Mr. R. J. Lukey) having read the advertisement convening the meeting, the report of the Directors was taken as read. They stated therein that the profits for the six months ending the 30th of June amounted, with the balance brought forward, to £67,433; and they recommended the payment of a dividend for the half year of 9s. each on the old shares, and in proportion on the new shares, free of income-tax. This would absorb £60,000, and leave £7433 to be carried forward. The Engineer (Mr. T. J. Bush, M.Inst.C.E.) reported that the whole of the plant was in excellent condition; but, in consequence of the increased consumption of gas, the Directors had decided to complete the second retort-house at the Mortlake station, which would involve an expenditure of about £25,000.

The CHAIRMAN, in moving the adoption of the report, expressed his pleasure in stating that the consumption of gas during the period covered by it had exceeded that of any previous six months; but, unfortunately for the Company, the same might be said with regard to the expenditure. This was owing principally to the increased price of coal, and to the necessity for using some which had not been so satisfactory in its results as had been anticipated. At the beginning of the month [July], however, the use of coal from the northern collieries—a three years' contract having been entered into for its supply at the prices current with the "Vend"—was resumed. It might be interesting to know that the advance in the cost of coal was almost universal; and consequently the Company were not alone in having to report additional expenses in the carbonizing department. The consumption of gas during the half year exceeded 976 million cubic feet—an increase of nearly 81 millions, or upwards of 9 per cent., on the corresponding period of 1906. This increase, he was glad to say, was not only being maintained, but was likely to still further expand in the future; and therefore the Directors had decided to complete the extension of No. 2 retort-house at Mortlake, involving an outlay of £25,000, to meet the contemplated demand for gas. The machinery and other material necessary for carrying out the work had been ordered; and it was hoped everything would be ready and in working order by next winter. In this connection, it was gratifying to notice that the extension of the Company's business was very general in both the city and the suburbs. The newer suburbs, particularly those on the North Shore line, commanded a great deal of the Board's attention, in consequence of the developments going on. The Ku-ring-gai Shire Council, who control the greater portion of the district covered by the Company's mains on that side of the harbour, had undertaken the public lighting of most of the suburbs between Roseville and Wahroonga; and the President of the Council hoped the remainder would be lighted by the end of May next. The extension of the public lighting to these suburbs would undoubtedly add to the attractiveness of the neighbourhood, and be of great benefit to all concerned. His attention had been drawn to the desire expressed by some of the Municipal Councils in the eastern suburbs for the lighting of the Domain and Centennial Park, in which he concurred; but he certainly thought the Government should afford the Gas Company as well as the City Council an opportunity of tendering for it. A short time ago the Company were asked to submit a scheme for the lighting of these parks, based on ordinary incandescent gas-burners, and they did so. But nothing came of it—he understood from want of funds. Now that the matter was again before the public, and the City Council had been named in connection with the electric lighting of the parks, he hoped the Government would not be one-sided in their action, but afford the Company an opportunity of submitting a tender in connection with the high-pressure system of incandescent gas lighting, which had been adopted with the utmost success in the new streets of London and other parts of the Metropolis, as well as in other large cities and towns in England and elsewhere. He had recently seen a series of photographs taken of the sections of the Dublin Exhibition and grounds allotted to high-power gas lighting, and the effects to him were simply marvellous. As he examined the pictures he could scarcely believe such effective artificial lighting could be produced. What could be done at home could be accomplished in Sydney, if the Company were given the opportunity and sufficient financial inducement was forthcoming. Notwithstanding the various attempts to relegate gas to the background, the industry was as buoyant as ever, and maintaining the lead in the great artificial light competition of to-day. He need not again go over the ground he traversed in his last address respecting the great strides gas was making in the capital of England, as well as in other large cities and towns in the British Empire and on the Continent of Europe, except to say that the expansion continued, even to a far greater degree. Those who, for interested motives, failed to observe the signs of the times in this direction, must ultimately find out the weakness of their position. He was very pleased to receive, a few days previously, a letter from an old Australian friend who was now on a visit to the Continent and England for the first time. Knowing the interest he (the Chairman) took in all matters relating to gas, he wrote to this effect.

At Marseilles, Nice, and in Paris, and also in London, gas is more than holding its own. Outside all large hotels, places of amusement, and city centres where electric light is used up to midnight, the bulk of the lighting appears to be gas. On the Champs Elysées, the Boulevards, and other beautiful places in Paris, the lighting is all by gas. All the places of amusement and refreshment in these grounds are brilliantly illuminated by gas. It is evident that with the cheaper illuminant they are able to be lavish in its use, and to carry the gas among the trees; thus preventing the shadows that are inevitable with the electric light. In several places in London—taverns especially—the electric light has given place to a scheme of illumination by gas taking the form of very large lamps glazed with heavy glass with stars and other devices embossed thereon; the four burners inside each lamp producing a most brilliant effect.

In the earlier part of the year, London celebrated the centenary of gas lighting in that city. They were told that just a hundred years ago (Jan. 28, 1807) vast crowds assembled in Pall Mall to gaze at a row of gas-lamps in front of the colonnade before Carlton House, in honour of the birthday of King George III. What a contrast to the public and private gas lighting of the City to-day! He was reminded that the Australian Gaslight Company had now passed its 70th birthday; and few companies could boast of so interesting a history as theirs. The "Sketch" published by the Secretary on the occasion of the Company's Diamond Jubilee in 1897 was full of interesting reminiscences.* The growth of the Company had been most remarkable; and the shareholders and consumers alike had shared its success. At the commencement of the Company's career, the charge for gas was at so much per light; but afterwards, when meters were introduced, the rate was 25s. per 1000 cubic feet, and public lamps cost £10 a year. To-day the price to ordinary consumers was 4s. per 1000 cubic feet, and the charge for the public lamps was £4 per annum. The Company's present rates compared very favourably with those of English gas companies, when the extra cost of labour and the additional charges, with heavy duties, attaching to the importation of most of the necessary material and plant from abroad in connection with the manufacture of gas, were taken into account. The Company had now laid 2166 miles of mains and service pipes; the consumers numbered 77,161 (an increase of 2465 during the past half year); and there were 10,540 public lamps. The applications for penny-in-the-slot meters showed no sign of abatement; the number of houses at present fitted up exceeding 25,000. It was interesting to note that many of their customers had of late been purchasing the Company's fittings, and had thus become ordinary consumers. In some instances they had put in additional lights and also gas-cookers, and thereby very materially augmented the consumption of gas. The number of gas-cookers sold by the Company to date was 15,176; being an increase of 564 during the half year. The proprietors would readily imagine that the staff must necessarily be a large one. Including officers, clerks, and workmen, it numbered at present 370. The advance of the Company during the past seventy years had been marvellous; and he could see nothing at present that was in any way likely to mar its progress in the future.

The DEPUTY-CHAIRMAN (Mr. J. H. Storey) seconded the motion, and it was carried unanimously.

The retiring Directors and Auditors were then re-elected; and the proceedings closed with a hearty vote of thanks to the Directors for their services during the half year.

## MELBOURNE METROPOLITAN GAS COMPANY.

The Half-Yearly General Meeting of this Company was held in the Offices, Flinders Street, Melbourne, on the 27th of July—Mr. JOHN GRICE, the Chairman of the Company, presiding.

The SECRETARY (Mr. John Hinde) read the notice convening the meeting, and the report of the Directors, which was accompanied by the accounts for the six months ending the 30th of June, was taken as read. It showed that the net profits for the half year, including a balance of £2449 brought forward, amounted to £63,163, from which the Directors had transferred £12,500 to the reserve fund account, and £2500 each to the meter renewal fund and gas-stoves, &c., account; and they recommended the payment of a dividend at the rate of 5s. per share, amounting to £42,860, which would leave £2803 to be carried forward.

The CHAIRMAN, in moving the adoption of the report and accounts, said they showed that the Company maintained a satisfactory position, and gave evidence of an increase of business on sound lines. On the credit side of the profit and loss account, it would be seen that the total receipts amounted to £208,965, against £187,473 for the corresponding period of last year—an addition of £21,492, of which £14,828 was due to sales of gas by meter; the balance representing all-round increases in the results from sales of residuals. The total quantity of gas sold for the half year showed the very substantial advance of nearly 10 per cent. over the figure for the like period of 1906. In his remarks at the half-yearly meeting in July last year, he said the Directors anticipated that in another twelve months they would be able to show a very considerable increase in consumption through slot meters; and this anticipation had been fully realized. At that time 3027 of these meters had

* The "Sketch" referred to was noticed in the "JOURNAL" at the time of its publication (see Vol. LXXI., p. 1125).

been installed in three of the Company's districts. During the intervening period, the system had been extended to two others (Port Melbourne and Richmond); and the number of these meters fixed on the 30th of June last was 6509—the quantity of gas consumed by slot meters during the half year just completed being a little over 27 million cubic feet, against about 11¾ millions in the June half of 1906. There was no falling off in the demand for these installations. On the debit side of the profit and loss account there were one or two items calling for remark. The cost of coal was £6022 more; but this was mainly due to the greater tonnage purchased to meet the demands of the additional business done, though the higher price under the new contract accounted for some portion of it. In reference to this matter, the shareholders were informed twelve months ago that tenders had been invited for the Company's requirements dating from the expiration of the contract on the 31st of March last, and that for certain reasons no tenders had been received. He was now able to report that a contract had been signed for three years from the 1st of April; the extra cost to the Company, on the present basis of consumption, being about £6000 per annum. The amount of wages at the works was larger, owing to additional business, and also to the increased rate of pay granted to stokers and others in the early part of the present year. By far the most important figure, however, on this side of the account was that under the heading of "Repairs and maintenance of works," which showed an increase of £5703 over the June half of 1906. With respect to this item, it was necessary to point out that a considerable amount of money was being spent on schemes of reconstruction at two of the works, rendered necessary by the largely increased demand for gas, and also by reason of the plant becoming obsolete and worn out. At the West Melbourne works, the reconstruction of No. 2 retort-house was nearing completion; and when finished it would have cost about £15,000. The retort-house had been built on up-to-date lines—regenerative furnaces being installed throughout; and the reconstruction had been designed with the object of making the operations as automatic as possible. The old stoking machinery, which was now worn out, had been abandoned, and one of the latest types—the De Brouwer—installed; and whereas under the old system two charging and two drawing machines were required to fill and empty the retorts, with the new system two machines would do the whole of the work. The motive power for these machines would be electricity, for which generators driven by gas-engines were being put down. At the South Melbourne works, more extensive reconstruction was needed, in order to bring the retort-house up to the present-day standard, and to meet the increased output of gas from these works. This had lately been exceptionally heavy, partly owing, no doubt, to the large number of slot-meter installations in the Company's southern district. The first portion of the scheme comprised the reconstruction of the northern half of the retort-house, and involved a general re-arrangement, so as to provide increased accommodation for the storage of coal—a very necessary provision. The retort-settings at these works were at present direct-fired; but the Directors had decided to instal the regenerative system, and all the new settings (20 in number) would be heated by this more economical method. It was intended also to equip the retort-house with the latest form of stoking machinery, in order that the manufacture might be conducted as economically as possible; and it was necessary, in order to carry out this reconstruction, and to provide room for the modern plant, to raise the roof of the retort-house. It would thus be seen that there was a considerable amount of work ahead, which it was anticipated would occupy the greater portion of the next twelve months. When completed, the reconstruction of the northern half of the retort-house at South Melbourne would have cost the Company some £32,000. The southern half, the reconstruction of which would follow in the immediate future, if the output of the Company continued as was expected, was estimated to cost some £13,500 extra; making a total expenditure at South Melbourne of £45,500. With the new plant, they anticipated being able to obtain an increased quantity of residuals for sale, and also to manufacture gas considerably cheaper than was being done at present. One item, though small in amount, was well worthy of passing reference, as evidencing the care exercised by the officials of the Company—viz., "Bad and doubtful debts," which showed a reduction, notwithstanding an increase of over £20,000 in revenue; the bad debts representing only ¼ per cent. of the revenue. The rest of the figures were normal; and the balance carried to the net revenue account was £6573 more than last June. In order to meet expenditure out of the reserve fund for the half year, it had been found necessary to effect a transfer from net revenue of £12,500; and £2500 had been passed to the meter renewal fund, to replace withdrawals, and the gas-stoves, &c., account had been credited with £2500 for depreciation. After making these transfers, and providing for a dividend at the usual rate, £2803 remained to be carried forward. The business of the stoves and fittings department continued to exhibit satisfactory results; and the constantly increasing sales—which were very marked indeed in gas-irons, boiling-burners, the issue of stoves on hire and by sale—had no doubt contributed in a very substantial manner to the additional quantity of gas passing through the meters. It was gratifying to know that the Directors' efforts to maintain the position of the gas industry in Melbourne in the face of keen competition, were meeting with the approval of the public. They had quite recently had an instance of this in the case of the New Bijou Theatre, where a complete installation of incandescent gas lighting had been put in the building, and had proved most successful; for though the electric light was also installed, gas was used in preference. Those who had seen the theatre thus lighted preferred the gas as being a better and a softer light. The system adopted, to which attention had been drawn in the Press, was unique in its way, and was suitable for use in similar large buildings. It was important that it should be widely known that the decided advantage electricity alone previously held (of immediately switching on and off) had been rendered applicable, with gratifying results, to gas lighting. Attention had been drawn, on more occasions than one, to the large proportion of complaints, due entirely to faulty gas-fittings, calling for attention at the hands of the staff. As the proprietors were aware, the Company had no authority to interfere with the internal fitting up of houses, and it often happened that the pipes put in were much too small to carry the number of burners they were expected to serve. Frequently the supply to both bath-heaters and gas-fires was taken from pipes which, even in the first instance, were barely sufficient to maintain a proper supply to the burners; the consequence being that the heaters and fires were never adequately served, and when they were in use the result was an immediate falling off in the illuminating effect produced by the lights. Failing legislation dealing with this subject, much could be accomplished if the Gas Company were consulted before the sizes and the positions of pipes were decided upon for new buildings. In this connection, he might say that a step in the right direction had been taken by several prominent firms of architects in Melbourne, who had asked the Directors to co-operate with them in determining the most suitable method of installing new premises. He mentioned this matter now because he was convinced that the adoption of such a course generally would bring about greater mutual satisfaction to the consumer, the architect, and the Company. Since the last meeting the High Court of Australia had given their decision, after protracted litigation, declaring the Welsbach patent invalid. To the gas consumers in Victoria the result was not of the same moment as it would have been some years ago, inasmuch as the current prices for mantles had been greatly reduced; and, in any case, the patent would have expired by effluxion of time on March 31, 1908. During the previous few days, the Judicial Committee of the Privy Council had heard the appeal of the Company against the decision of the High Court of Australia with respect to the adoption by the City Council of Melbourne of the "maximum demand" system of charging for a supply of electricity as an alternative to the flat-rate. The members of the Privy Council had reserved their decision. In the meantime, it might be assumed, from the attitude of that body, that the points raised involved serious consideration.*

The Hon. THOS. LUXTON, M.L.C., in seconding the motion, said the Chairman had put the position of the Company so clearly before the meeting as to leave very little room for criticism. He was delighted to know that the slot-meter system was paying so well. When the subject was referred to twelve months ago, some of the shareholders thought the adoption of the system involved a certain amount of risk; but it was now evident that the Directors had acted wisely in the matter, as shown by the results to date. The number of these meters installed was increasing day by day; and he felt assured that the quantity of gas consumed through them would be a source of great revenue to the Company in the future. It was gratifying to the shareholders to know that during the past six months the profits had exceeded by £6573 those of the corresponding period of last year; and as time went on he thought the position would still further improve. The Company had undoubtedly very bright prospects. A word of praise was due to the officials for keeping the bad debts at so low a figure as ¼ per cent. of the total revenue, which was sufficient evidence of the careful manner in which the business was being conducted.

The motion was carried unanimously, and the dividend recommended was declared.

A vote of thanks was accorded to the Chairman, who, in acknowledgment, remarked that his office was rendered comparatively easy by reason of the prosperity of the Company, which was in part—in fact, he would say to a very great extent—due to the officials. This applied not only to the Secretary and the Engineer (Mr. P. C. Holmes Hunt), but to the heads of the various departments, who were most enthusiastic in their work; and he did not think a better body of men could be found.

The meeting then terminated.

* The decision of the Privy Council was noticed in the "JOURNAL" for the 20th ult. (p. 519).

## COLONIAL GAS UNDERTAKINGS.

Reports on the working of several Colonial gas undertakings have lately come to hand, and the following particulars are extracted from them:—

In the half year ending the 30th of June, the sale of gas, &c., by the Brisbane Gas Company produced a revenue of £22,686; and the balance at the credit of the profit and loss account, with the amount brought forward, was £12,772. The Directors recommended a dividend of 5 per cent., which amounted to £8000, and income-tax came to £400. This left £4372 to be carried forward. In the six months covered by the report, the Company's mains were extended into various suburbs.

The Maryborough (Queensland) Gas Company, Limited, had in the half year ending June 30 a revenue of £2885 from the sale of gas, fittings, &c., and £159 from the sale of residual products. These two sums, with the balance brought forward (£1058), made a total of £4102. The manufacturing and other charges and the dividend for the six months ending Dec. 31, 1906, came to £3033; leaving a balance of £1069. The Directors recommended the payment of a dividend at the rate of 6 per cent. per annum (free of income-tax), amounting to £771; leaving £298 to be carried forward.

At the recent meeting of the City of Newcastle Gas Company, Limited, the Directors presented their 82nd half-yearly report and balance-sheet. They showed that the profits, after meeting all charges, amounted, with the sum brought forward, to £4582. From this the Directors recommended the payment of the usual dividend of 3s. per share, free of income-tax, which would absorb £3375, and leave £1207 to be carried forward. The sales of both gas and residuals were satisfactory during the half year.

The North Shore (Sydney) Gas Company, Limited, had a net profit, after allowing for reserve and depreciation, of £5997, in the six months ending the 30th of June. Adding the amount brought forward, a sum of £6060 was produced, out of which the Directors recommended a dividend of 4 per cent. for the half year, the payment of which would absorb £5999.

The Horley and District Gas Company have placed an order with Messrs. R. Dempster and Sons, of Elland, for a new retort-bench on Waddell's system, in accordance with detail plans and specifications prepared by the Company's Engineer, Mr. R. Seymour Tobey.

## SHREWSBURY GAS COMPANY.

The 87th annual report of the Directors of the Shrewsbury Gas Company, which was submitted at the meeting on Monday of last week, stated that the profit on the working for the year ending June 30 amounted to £8512. An interim dividend of 2½ per cent. was paid last March; and the Directors recommended the declaration of a final dividend of 3 per cent. (making 5½ per cent. for the year), which would leave a balance of £2304 in the profit and loss account. The reserve fund amounted to £10,387, and was fully invested. There was an increase of 4 million cubic feet in the consumption of gas during the year. The stoves on hire at June 30 numbered 2563; and there were 3130 slot-meters in use. There was a large increase in the cost of coal for the ensuing year; but it was not the intention of the Directors to make any change in the price of gas. The Board expressed deep regret at the loss of their colleague Dr. E. Calvert, who died in May last, after 28½ years' useful and valuable service as a Director.

Mr. T. F. Poole, who presided, said the Chairman (Mr. J. Spencer Phillips) was sorry not to be able to be with them; but he had forwarded some remarks on the Company's affairs. In the course of these, after referring to the loss sustained by the death of Dr. Calvert, he pointed to the very satisfactory character of the report. He said that during the year they had made 3,477,500 cubic feet more gas, or 1·798 per cent.; and they had sold 3,993,927 cubic feet more, or 2·28 per cent. But notwithstanding this increase of gas made and sold, there was a decrease of 211 tons, or 1·164 per cent. in the coal used in the manufacture of it. This was partly owing to the saving which the new plant effected, and partly to the care of the management in leaving no stone unturned to promote economy combined with efficiency. The unaccounted-for gas had fallen from 5·92 to 5·69 per cent., and had now arrived very nearly at the point at which it stood before the mains were so seriously damaged by the sewerage operations which were carried out some ten years ago. No endeavour would be wanting to reduce the figures if possible to a still lower ratio. The Company had had a good deal of trouble in their past history with naphthalene—a substance which, in spite of every care in the manufacture, still found its way at certain times (more particularly in the hot weather) into the mains, causing annoyance to the customers, and considerable expense to the Company in removing it. Three or four ways had been discovered for dealing with the difficulty; and finally, after having inspected the various apparatus, the Board decided upon installing the Colson system. They were very pleased to state that up to date they had found it most efficacious, as instead of having numerous complaints, they had not so far had a single one. They intended during the coming winter to adapt it to the old works, as at present it had only been installed in the new ones. Out of the past year's income, the Board had paid for the alteration of the offices—an outlay which had proved of great convenience to the customers and the staff. The year's revenue had also been charged with the expense of the valuation for the rating of the works, an expenditure which had been thoroughly justified by the result of the assessment, increased though it unfortunately was. They had also painted the whole of the works—an expense which was generally spread over two years. Notwithstanding these rather abnormal drains, they were able to pay the same dividend as last year, and to increase the carry-forward from £1804 to £2304—an addition of £500. The outlook for the coming year was not quite so hopeful, owing to the great rise in the price of coal. This increase hit equally hard every gas and railway company in the kingdom, as well as most large manufactories. But in spite of the large increased expenditure they had to face on this head, the Board had not thought it necessary on this occasion to raise the price of gas; and they believed there was no doubt of their being able to maintain the dividend—a result which would commend itself to the shareholders as showing what had been done to manage their affairs with caution and prudence. It was, perhaps, unnecessary to add that everything had been done to keep the works and plant up to the highest possible state of efficiency, a matter to which the Manager, Mr. W. Belton, gave his closest attention—as indeed he did to the whole welfare of the Company. This certainly never would be neglected as long as the shareholders entrusted the present Board with the management of their affairs. The proper upkeep of plant and machinery was of most vital importance in any trading or manufacturing concern.

The report was adopted, the dividend recommended was declared, and the Chairman and Directors and Mr. Belton and the other officers were thanked for their services.

## HARROW AND STANMORE GAS COMPANY.

The Ordinary Half-Yearly Meeting of this Company was held on Monday of last week, at the Holborn Restaurant, W.C.—Mr. A. H. Baynes in the chair.

The Secretary and Engineer (Mr. J. L. Chapman) read the notice convening the meeting; and the Directors' report and accounts were taken as read. The report stated that, following the reduction in the price of gas, there had been a satisfactory increase in the consumption during the past half year, as compared with the corresponding period of 1906; and notwithstanding the great advance in the cost of coal, the Board had no intention of increasing the price of gas. The Directors had, under the compulsory powers of their Act, arranged to purchase a further 3 acres of land; and the Engineer was now enlarging the new retort-house upon the ground where the last portion of the old works ately stood, to meet the continuously increasing demands upon the Company. The balance of profit and loss account was £7971.

The Chairman, in moving the adoption of the report and accounts, remarked that when last he had the pleasure of meeting the shareholders, he congratulated them on having had presented to them the best report that had ever been distributed by the Directors of the Company; and he thought he might that day congratulate them on the fact that the report in their hands (for the six months to June 30) showed continued progress. If they compared the results of the last half year with those of the corresponding period of 1906, in the few figures he was going to give they would agree that he was not wrong in stating that considerable advance had been effected. The gas-rental for the half year just closed amounted to £12,971, an increase on the first half of the preceding year of £916—and this notwithstanding the fact that the price of gas for the March quarter was 3d. per 1000 cubic feet lower in the inner area and 4d. in the outer area, and that for the June quarter the charge was lower by 2d. throughout the entire district. He thought that the consumers had been very well treated indeed in respect of these continuous reductions. Had it not been for the lowering of the price, the increase in the rental would have amounted to £1737. The coke and residual accounts showed an increase of £556. The receipts from tar were £92 more; and the total receipts for the half year came to £16,810, which was an increase of £1681 on the first half of 1906. The total expenditure for the first six months was £11,393, which was an increase of £1234. It could not, however, be but satisfactory to know that the cost of the new retort-house had been practically speaking paid for out of revenue. The pulling down of the old retort-house, and cleaning of the bricks had been charged to repairs, the increase under which head was £486. Of coal, 525 tons more were carbonized, which involved an extra cost of £585. Carbonizing wages, as might be expected, were more by £43; and rates and taxes, which seemed to be always increasing, exhibited a rise of £76. A sum of £25 had been added to the workmen's insurance fund; and £200 had been written off prepayment house services, and similar amounts off meters and stoves. The total profit was £5417—an increase of £447. The dividends recommended were as last time, and would amount to £4405, to which had to be added debenture interest and interest on loans £583, leaving a balance to be carried forward of £429. Adding this to the previous balance of £3137, there was a total amount to be carried forward of £3566. The quantity of gas made during the past half year was 73,902,000 cubic feet, of which 51,283,000 cubic feet was coal gas, and 22,619,000 cubic feet carburetted water gas. The quantity of coal carbonized was 4646 tons; the production of gas being 11,038 cubic feet per ton. Of oil, the amount used was 57,155 gallons, the production of gas being 1000 cubic feet per 2·52 gallons. The gas sold was 70,168,000 cubic feet, which was equal to 94·95 per cent. of the total make. The gas used on the works was 1·35 per cent., and the unaccounted-for gas 3·70 per cent., of the make. Compared with the corresponding period of 1906, the consumption of gas during the past half year in the Harrow district showed an increase of 17 per cent., in the Sudbury and Harrow Weald district an increase of 27 per cent., and in Stanmore an increase of 8·13 per cent. He thought the shareholders would regard these figures as indicating very considerable progress in the half year under review; and they ought to congratulate Mr. Chapman upon his management during that period.

Mr. H. J. Rydon seconded the motion.

Mr. J. H. Lea asked whether the Directors thought of making anything like "Coalite" or "Carbo."

Mr. Chapman said the Board had no idea of doing so at present.

The resolution was then carried unanimously.

On the motion of the Chairman, seconded by Mr. A. F. Phillips, dividends were declared for the half year at the rates of 10 per cent. per annum on the original "A" capital, and 7 per cent. per annum on the additional "B" capital, the additional "C" capital, and the guaranteed shares—all less income-tax.

Mr. Phillips, in proposing a vote of thanks to Mr. Chapman and his able assistants for the excellent results they had achieved during the past half year, remarked that, considering the competition with the electric light that had to be met in Harrow, it must be as gratifying to their Engineer as no doubt it was to the shareholders to find that there had been an increased sale of gas in the district of 17 per cent. Not only had Mr. Chapman watched over the development of the consumption, but the figures in the accounts showed that the manufacture and distribution of gas also received his careful attention.

Mr. R. S. Bathe, in seconding, remarked that, speaking as a resident in the district, he was surprised the Company had been able to do as well as they had; and he thought great credit was due to the management.

Mr. Chapman, in returning thanks for the vote, said they had got into a condition of going forward, which did not seem to pass away; for the same increase was going on to-day as was shown in the balance-sheet presented at this meeting. The results achieved were largely due to his assistants and workmen entering into the new conditions. They had all done their best; and he had suggested to the Directors that they should not forget that this was the case. He thought they would arrive at still better results as time went by.

Mr. F. Lennard proposed a vote of thanks to the Chairman and Directors; and Mr. F. R. Smith, in seconding, said he heartily agreed with the policy adopted, of reducing the price of gas and as far as possible charging extensions to revenue account. The latter was a sound policy, and would reduce the capital expenditure of the Company—which was one of the main things to be sought after. The increase in consumption was, to his mind, almost phenomenal.

The Chairman, in reply, said the Board were glad to be able to present such a report; and they felt that congratulations were due to Mr. Chapman, who had devoted himself in a most remarkable manner to the interests of the Company.

**Increase in Price at Blyth and Cowpen.**—At the recent half-yearly general meeting of the Blyth and Cowpen Gas Company, it was reported that a balance of £3060 had been carried to the profit and loss account; and a dividend of £3 per cent. was declared on the ordinary stock. In the course of his remarks, the Deputy-Chairman (Mr. R. G. Dobson), who presided in the absence of the Chairman, alluded to the inflated state of the coal market; stating that the Directors had entered into a contract for the supply of coal at an increase of 3s. 7½d. per ton, which was an advance of 30 per cent. at least upon the one just concluded; and in consequence the Directors would be reluctantly compelled to give notice to all consumers that after the meter readings this month the price of gas would be increased 2d. per 1000 cubic feet—from 2s. 10d. to 3s.—the discounts to continue as heretofore.

## PROVINCIAL GAS COMPANIES.

### Reduced Price and Increased Sales at Bath.

At the recent half-yearly meeting of the Bath Gas Company, the Directors reported that there had been an increase of nearly 4 per cent. in the quantity of gas sold in the six months ending the 30th of June, compared with the corresponding period of 1906, which was sufficient to cover the loss in revenue consequent upon the reduction made in the price of gas. There was a good demand for coke; and as the sulphate of ammonia account showed up well, the returns for residuals were very favourable. The statistical statements accompanying the report showed that the revenue from the sale of gas in the half year was £29,861, against £29,815 in the first half of 1906; while the residuals produced £10,272, compared with £8564. The total receipts were £43,979, against £42,011. The expenditure on the manufacture of gas was £23,025, against £23,249, though the raw material (coal and oil) cost more—£16,100, compared with £15,172. The saving was on the repair and maintenance of plant, on which £3949 was spent in the past six months, and £5100 in the corresponding period of last year. Distribution was higher—£5472, against £4679; but management was about the same as before. The total expenditure was £32,701, against £31,824; and the balance carried to the profit and loss account £11,278, compared with £10,187. The amount available for distribution was £11,537; and the Directors recommended the declaration of the maximum dividend of 5 per cent. per annum, less income-tax, on the consolidated ordinary stock. Reference was made in the report to the passing of the Gas Companies (Removal of Sulphur Restrictions) Bill last session, whereby the Company have obtained relief from these restrictions at a moderate cost.

### Satisfactory Position of the Falmouth Company.

In spite of some adverse circumstances, the Falmouth Gas Company have had a successful year; and Major Mead, the Chairman, was able, at the annual meeting yesterday week, to congratulate the shareholders on the presentation of the most satisfactory account the Company have had. The report of the Directors referred to the passing of the Bill promoted last session, and recorded the fact that a new building and plant for the manufacture of sulphate of ammonia had been erected. The total receipts amounted to £10,146, of which a sum of £8065 was from ordinary sales of gas, £1556 from coin meters, £394 from rental of meters and stoves, and £1564 from rents of property. Last year's total receipts were £9633; and the balance of profit this year was £2848, compared with £2615 before. An interim dividend of 5 per cent. had been paid, and 1 per cent., the balance of the statutory dividend, carried to the reserve fund. The Chairman said that with extra care the Directors had been able to avoid an increase in the price of gas, and had, indeed, improved the quality. The proprietors must not, however, expect such a satisfactory account next year, for coal had again risen, and they had to face the opposition of the electric light. In addition to putting in new sulphate of ammonia plant they had during the past year passed their Bill through Parliament (with practically no opposition), and bought the property adjoining the works. They were now safe for another twenty years, and need not trouble about any expenditure on parliamentary costs. The output of gas had increased a little; and considering the introduction of the electric light, the Company were not doing badly.

### Progress at Hastings.

Dr. G. G. Gray, J.P., the Chairman, presided over the meeting of the Hastings and St. Leonards Gas Company last Thursday; and in moving the adoption of the report and accounts for the half year to June 30, he said there had been an increase in the amount of gas sold, in round figures, of 9¼ million cubic feet—equal to 4·32 per cent. There was an increase from meters and stoves of £116, from residuals of £2162, and from various small items of £49. The total increase on the half-year's revenue amounted to £2687. With regard to the residuals, coke showed a large increase, due principally to the rise in the price of coal. There had been an increase under the head of tar due to a better price, owing probably to the amount now used for motor traction. On the expenditure side, there was an increase under the head of coal, oil, &c., of £2169, due in part to using more, but mainly to the rise in the price. There had been a total increase of £2827 on the expenditure side, from which certain deductions left a net increase of £2533. There was a net increased profit of £154 on the half year, the profit balance for the half year being £12,005. In spite of competition, fair and unfair, of mis-statements, honest and dishonest, the half-year's consumption of gas showed a real and substantial increase on a sound and businesslike balance-sheet. They did not increase their revenue by supplying to themselves all the gas that they could. They did not pay more for an article when they could get equally good, or even better, results at a lower cost; and objection to such extravagance was all the stronger if official sanction to it had been refused after a public inquiry. Putting money into one pocket by taking it out of the other was no gain, especially if some was lost in the transfer. They did not expend money in putting in new mains where they were not assured of sufficient customers to justify the expenditure. Their local rates on every pound of gross profit made amounted to 2s. 3½d.; and they could not escape the usual rating by paying only 5⅛d. in the pound. Their income-tax came to £639; they did not omit to debit themselves with it. It was not in this way that they showed an increase or a balance. And they were not afraid of having their accounts criticized; they were pleased to hear any, even if interested in any competing illuminant, knowing that the accounts would bear full investigation. The one unsatisfactory feature was the high price of coal and oil. With their large consumption, an increase of 3s. 4d. per ton—which they had to pay under their present contract, expiring next June—was equivalent to £3000 on the half year, or 2d. per 1000 cubic feet manufactured. This required a good deal of making up. In consequence of this rise, most companies had raised, or had given notice that they would raise, the price of gas 2d., 3d., or even more per 1000 cubic feet. The report and balance-sheet showed that they did not require at present to do so; and the Board hoped that they might not have to during the next half year. But neither did they, in the face of such facts, propose to reduce the price of their manufactured commodity, either by a real or a fictitious concession. If the reduction was only apparent—a juggling with figures—it was illusory and misleading; if it were real, it was unsound finance, and absolutely unjustifiable under existing circumstances. They had not the rates to fall back upon to make up any deficiency; and they could not make people who did not use their illuminant pay for what they did not want. How long would ratepayers suffer in silence, instead of arising, as at Islington, and stopping such burdens on the rates? They heard of a good many new electric lamps, which were to cheapen that method of illumination to compete with gas. They reminded him of Pope's line that "Man never *is*, but always *to be* blest." All new electric lamps the Company tested in order to prove their real illuminating value and cost. They knew, therefore, that it was misleading to speak of the light which could be obtained by one of these lamps, and the cost thereof, when they could only be used in couples, and to over-state the light they gave, and to under-state that of the lamps with which they were compared. They had long been told that "electricity is the light of the future;" and they were content that it should remain so. Gas was still the light of the present. The report was adopted; and the statutory dividends were declared. Moving a vote of thanks to the Directors, officers, and staff, Mr. Oke eulogized the work of Mr. C. E. Botley, M.Inst.C.E., the Engineer and Manager, and others at Glyne Gap. In reply, Mr. Botley said the results were improving every month.

### A Good Position at Richmond.

Addressing the shareholders at the half-yearly meeting of the Richmond Gas Company, the Chairman (Mr. T. J. Carless) said that the capital expenditure in the six months to June 30 had amounted to about £700, which had principally been spent in laying new mains and services in the districts east and north of the gas-works, where building operations were being actively carried on, and from whence they expected shortly to reap the benefit in a large consumption of gas. A certain amount had been expended on cooking-stoves, for which there was still a good demand, notwithstanding the fact that they had at the end of the previous half year over 4000 in use. Turning to the revenue account expenditure, the cost of coal was less by nearly £300, as a result of more efficient carbonizing, a matter upon which the Chairman congratulated those responsible for the working. As to the future, the rise that had taken place in the coal market was giving the Directors much anxiety, as they were most wishful not to increase the charge for gas. Competition by other illuminants was much keener than it used to be; and many additional expenses were incurred in obtaining business which some years ago were not thought of. In regard to revenue account receipts, they were pleased to record an increase in the sale of gas which, though not large, showed progress, especially in these times when the incandescent burner had brought about such a decreased consumption for a given candle power. The increase in stove-rents, too, pointed to the larger number in use to which he had previously referred. Residual products had brought in more money. To sum up the revenue account, the balance compared favourably with the corresponding figures (and this was probably more than a good many undertakings were able to show), owing to the Company's judicious purchases of coal two years ago, when markets were anything but booming. The profit and loss account showed a sufficient balance to allow of the statutory dividend, with a slightly increased carry-forward; and he congratulated the shareholders on the result of the half-year's working. The reserve fund was automatically growing; and the insurance fund had been increased to meet the risks under the Workmen's Compensation Act—the Board having decided to pay to the fund an equivalent of the premiums which would otherwise find their way into the coffers of the Insurance Companies. Experience in the past had been favourable to such a plan. The report was adopted, a dividend at the rate of 5¼ per cent. per annum on the ordinary stock was declared, and the services of the Board and of the Engineer and Secretary (Mr. Thomas May) and staff were suitably acknowledged.

### Coal and Assessment Questions at Southend.

The Directors of the Southend Gas Company reported, at the half-yearly meeting last Tuesday, that the sale of gas in the six months ending the 30th of June had been 130,574,400 cubic feet; being an increase of 15,211,400 cubic feet, or at the rate of 13·18 per cent. on the sale in the corresponding period of last year. The number of consumers had risen by 843; the total being 10,569, of which 6953 were on the prepayment system. The accounts showed a sum of £8795 available for distribution; and the Directors recommended dividends at the rate of 5¾ per cent. per annum on the original, consolidated, and new ordinary stocks, and 5⅜ per cent. per annum on the new ordinary "B" stock, all less income-tax. The payment of these would absorb £6119, and leave £2676 to be carried forward. In moving the adoption of the report and accounts, the Chairman (Mr. C. Frank Woosnam) expressed his pleasure in referring to the increase in the quantity of gas sold during the past half year. There had been 813 new cookers fixed; and the Directors trusted that the great increase which had taken place in the price of coal would bring about an even greater demand for heating and cooking, by which means, and the higher price they hoped to realize for coke, they would be enabled to avoid raising the charge for gas, as many companies had been obliged to do. He did not know that he ought to say much about what the present or any other Government did with regard to coal; but he noticed that upwards of 4 million tons had been sent out of the country last year in excess of the exports in the preceding twelve months. His opinion was that we ought not to let all this coal go out of the country. We had good money back in return; but what did it mean? The rich mine owners and coal workers put up the price of coal; and this affected everybody, but more particularly the large industries. One trade depended upon another. Perhaps the Government would take this into consideration, and put a handsome tax on exported coal. The Directors had made contracts for another year, but at a cost of an extra 2s. 6d. per ton. Passing on to deal with the items in the revenue account, the Chairman pointed out that, under the Company's new assessment, the rates were £379 more than before. He reminded the shareholders that he mentioned at the previous meeting that the

Directors were going to appeal against the assessment. They did so; but he was sorry to say that the Quarter Sessions upheld the Assessment Committee's amended figures—one of the reasons, he understood, against the Company being that they had not appealed on the previous assessment, and therefore it must stand as correct. The Bench made this their datum; so in future, if they could not agree, they must contest every re-assessment. He saw by the "JOURNAL OF GAS LIGHTING" that there was some idea of gas companies promoting a Bill in Parliament for the rating of gas undertakings on a definite, fair, and understandable principle; and he hoped it would come about. The Southend Company's rates at the present time came to nearly £2000 a year, which was half as much again as they should be. With regard to workmen's compensation, the Directors had considered very carefully the effect of the new Act, and had decided that, for the present, it was better for the Company to pay a premium to an Assurance Company than to start a reserve fund for the purpose of meeting any claims. Mr. Lloyd Wise seconded the motion, and it was carried unanimously. The dividends recommended were then declared; and the proceedings closed with a vote of thanks to the Chairman, Directors, and officers of the Company.

**Progressing Business at Sunderland.**

The annual general meeting of the Sunderland Gas Company was held last Wednesday—Alderman Stansfield Richardson presiding. In their report, the Directors stated that during the year ending the 30th of June, 548 ordinary and 1580 prepayment meters had been fixed. They recommended the declaration of a dividend of 5 per cent. on the original stock and 4½ per cent. on the additional stock, less income-tax. In moving the adoption of the report, the Chairman said the Company's business was progressing year by year, and the stock was well held. They had had a very good year. The output was larger than in any year of their existence; there being a record growth of business of 74 million cubic feet, compared with the year 1905-6. It would interest the shareholders and public to know that prepayment meters showed a further increase; there being now in use 13,402, against 11,522 last year. These meters were a boon to the poor people, and fairly good business for the Company. They had suffered a little through evilly-disposed persons wrecking the meters and stealing the money contained in them; but he thought the punishment inflicted in a recent case was having a deterring effect. After referring to the works of the Company and mentioning the fact that the contract for the reconstruction of the Ayres Quay works had been let, the Chairman said, while the advance in the price of coal was still more marked than last year, he was happy to say the Board had been well advised, and the contracts entered into, as was the case last year, were well below the current value. Mr. T. W. Stewart, in seconding the motion, said the gas industry was to-day in a sounder position than ever it had occupied, notwithstanding the advance in electricity for lighting and motive power. The report was adopted, and the dividends were declared. It was agreed, on the motion of the Chairman, that in future the annual statement of accounts of the Company should be made up to Dec. 31 instead of June 30 in each year, and that the annual general meeting should be held in March instead of in September.

**The Goring Site Still Troubles Worthing.**

At the half-yearly meeting of the Worthing Gas Company on the 31st ult., it was stated that the past half-year's profit was sufficient not only to pay the standard rates of dividend, but to augment the undivided profit by £1096. The revenue account showed that the sales of gas for the six months were 10 per cent. beyond those in the corresponding period of 1906; and the profit and loss account had a balance of £12,175. Out of this sum the Directors in their report recommended the declaration of dividends at the rates of 10 per cent. per annum on the original stock, and 7 per cent. per annum on the share capital. The report was adopted. An extraordinary general meeting followed, at which the question of raising additional capital was discussed. The Chairman (Mr. H. H. Gardner) said the Company were bound, by contract, to purchase the new site at Goring for the erection of a gasholder in the immediate future; but, as at present advised, the Directors believed it would be some years before the manufacturing plant of the Company would be removed from its present site. He moved a resolution authorizing the raising, by the issue of new ordinary preference shares or stock, of the sum of £7000, and the exercise of the Company's borrowing powers. The resolution was carried, but not without opposition. Mr. Rodoconachi appealed to the Board to give up the Goring site, having visions of continued opposition. As an amendment, Mr. A. F. Somerset wished to have a Committee of Investigation formed to consider whether a site could not be found which would be less detrimental to the interests of Worthing. On being put, however, it was lost.

**Manchester Corporation and Income-Tax.**—The Finance Committee of the Manchester Corporation have instructed the Town Clerk to appeal against the action of the income-tax authorities in assessing the departments of the Corporation separately for income-tax. The Committee contend that the Corporation should be regarded in its entirety for the purposes of assessment, so that the losses in one department might be set off against the profits in another.

**Serious Gas Explosion at Nottingham.**—A serious explosion of gas occurred at a house in Corporation Oaks, Nottingham, last Wednesday night. It was in the occupation of Mrs. Woollatt, who, with her family, had just taken up her residence there. It appears that complaint had been made of poor lights in the drawing-room; and a plumber named Hempstead was about to pour some water into the slide of the chandelier when the explosion took place. He was seriously burnt about the face and hands, as were also two girls and a boy (Mrs. Woollatt's children) who were in the room at the time. Medical assistance was procured as promptly as possible, and the injuries were attended to. The fire was quickly extinguished by the Fire Brigade; but considerable damage was done to the house. It is supposed that gas had escaped from a faulty connection with a new meter in the pantry, which is below the drawing-room, and that the accumulated gas was fired by the light that was being used at the chandelier.

## THE INCREASED PRICE OF COAL.

### Sir George Livesey's Opinions.

In view of the various theories put forward as to the cause of the rise in the price of coal, a representative of the "Globe" had an interview with Sir George Livesey last Wednesday, to learn his opinion in regard to the influences to which the coal trade is subjected. The following is the report given of what transpired.

"There can be little doubt," said Sir George, "that the revival in the iron trade in the winter of 1905-6 started the rise in the price of coal. The foreign demand also began to increase; and this was greatly accentuated on the repeal of the export duty on Nov. 1, 1906. Since that time the foreign demand has gone on increasing."

"Are you prepared," asked the interviewer, "to state definitely that the main cause of the increased cost to the consumer at home is the removal of the 1s. export duty?"

"Well, the main cause is certainly the greatly increased foreign demand; and though I do not say that if the export duty had remained on there would not have been a great increase, I do not think it would have been so large."

"You are, therefore, strongly in favour of the export duty?"

"What I would have liked to see would have been the doubling of the export duty; for if the foreigner wants our coal, I see no reason why he should not pay for it."

"And what about the action of the railway companies in the matter?"

"The railway companies have been called upon to pay an enormously increased price for their coal. They cannot raise their rates; and so instead of carrying 20½ cwt. at the charge fixed for a ton, as heretofore, they are now only carrying 20 cwt. I would do the same, and so would anyone else."

"As a result of this foreign demand, the home consumer is being hard hit," remarked the interviewer.

"That must obviously be the case. As a Free Trader, I do not see why we should not get five millions or more every year from the foreigner, if he must have more of our coal, and thus help the English taxpayer, and by reducing the quantity exported assist every user of coal at home, whether it be a railway company, a gas company, the manufacturer, or the domestic consumer."

"And what about the outlook?"

"So far as I can see, there is no immediate prospect of reduction; and appearances point to still higher prices."

According to a Glasgow telegram last Wednesday, the price of coal in Scotland was raised to the highest level since the boom of 1900. Consumers are in a state of alarm at the prospect of existing rates lasting until the spring. The miners are easily earning 10s. daily; and if the men worked steadily it is estimated the output would be increased by one-fourth, and prices would rule 2s. cheaper. Since the boom began, prices have advanced 6s.—Russian and other Continental buyers paving premiums to get supplies shipped.

Mr. William Lorimer, presiding last Wednesday in Glasgow at a meeting of the shareholders of the Steel Company of Scotland, said no industry in the country could be assured of permanent demand for its output if the cost of production were to be so gravely affected by the existing extravagant price of coal. Dear coal was the black spot in the trade outlook. It was of the gravest importance that the advance should be arrested, particularly as competition was growing in Germany and America.

A Darlington correspondent of the "Financial News" states: "Not more than once during the past forty years has house coal continued at winter prices all through the summer, as has been the case this year. Coal owners and colliery agents of great experience in the county of Durham are of opinion that, owing to the abnormal demand for manufacturing and export coal, the rates for house coal will show another advance next month, as it is even now fully 6d. to 9d. a ton below the price obtainable for coal for export and manufacturing. The extraordinary demand is due to the requirements from Germany in particular, though Russia, Norway, Sweden, and France are all taking more than usual. Should this demand continue through the winter, prices of house coal will assuredly go up still higher—the most modest expectation being a further increase of 2s. by mid-winter; and many believe rates will rise as much as 5s. a ton above present prices."

## ABERDEEN CORPORATION GAS SUPPLY.

### The Past Year's Working—The Estimates for 1907-8

At the Meeting of the Aberdeen Town Council on Monday last week, Bailie Kemp, the Convener of the Gas Committee, presented the accounts of the Gas Department for the year ending the 31st of July, a summary of which was given in our Scotch Correspondent's "Notes" last week. He said the total income, as shown in the revenue account was given as £112,746, while the expenditure was stated at £92,950. The latter figure was some £913 more than in the preceding year. This was not to be wondered at when one considered that coal alone cost some £3550 more than in the previous year. One-half of this large increase arose from an advance in price; the remainder arising from the greater quantity required. The balance carried to the net revenue account was £19,795, or £790 less than before. They started the year with £9976 in hand, of which they had used £3589; leaving to be carried forward to the next account £6387. This looked at first sight as if they had lost something on the year's working; but, as a matter of fact, it was not so. Out of this amount a sum of £4000 had for the first time been carried to a renewal fund. When this item was taken into account, it would be seen that, notwithstanding the greatly enhanced cost of material, the revenue had more than met the expenditure of the year. The total capital expenditure up to July 31 was £350,093. Loans on mortgages and annuities were down by £13,044; sinking and contingent funds

were up £10,430. The reserve and fire insurance fund was increased by £1528; while, as mentioned, there appeared this year as a renewal fund for the first time, £4000. During the year there had been manufactured 725,301,000 cubic feet of gas; being an increase in round figures of 34 million cubic feet. There were one or two instructive facts which did not appear in the accounts, but which it might interest the Council to know. In 1900 the number of consumers stood at 30,001. On July 31 last they stood at 31,987. In 1900 the number of slot-meter consumers was 2444; but at the close of the year under observation they stood at 7067. In 1900 the number of gas heating and cooking stoves on hire was 1630, and on July 31 they stood at 3572; being an increase of 296 on the previous year, and of 1128 on the number two years ago. From figures like these, and an increase in manufacture of from 20 to 30 million cubic feet per annum, it would not appear as if the days of gas undertakings were numbered. Turning to the estimate for this year, the revenue was anticipated to be £114,528, and the expenditure was put at £122,670. To meet this there was the estimated revenue of £114,528, *plus* £6386 carried forward, which together would leave an estimated deficiency of £1756. The enhanced price of coal represented a sum equal to 3d. per 1000 cubic feet of gas. In the opinion of not a few, the Committee would have been perfectly justified in raising the price of gas to meet the increased cost; but they had—he thought wisely—resolved to recommend the Council to leave prices as they were for another year. It would interest members to know that Glasgow had increased their price by 3d. per 1000 cubic feet, and Perth by a like amount; while several smaller towns had put their price up from 2d. to 5d. If the prices of coal did not return to a normal figure before another year, an increase in the price of gas must follow. Meanwhile, they could do without it; and it was to be hoped their action in this respect might tend to help many a one during the coming winter who would otherwise feel very severely the rise in the price of coal. He concluded by moving the adoption of the accounts, together with the estimate for the current year; and the motion was carried unanimously.

## THE GAS SUPPLY OF BRIGHTON.

### The Formation of the First Gas Company.

In the "JOURNAL" last week, we reproduced from the "Sussex Daily News" some particulars in regard to the early days of gas lighting in Brighton. We are now able, through the courtesy of Mr. R. Hesketh Jones, one of the Directors of the Brighton and Hove Gas Company, to supplement them by an account of the initial proceedings in connection with the formation of the first Company for lighting by gas the town which is regarded by many as the Queen of Southern Watering Places.

A meeting of the subscribers to the intended Company, and of parties desirous of being interested therein, was held at the Axe Inn, Aldermanbury, London, on the 24th of March, 1818, and a number of resolutions were passed. The first set forth that in the opinion of the meeting no time should be lost in forming a Company to carry into effect the desire of His Royal Highness the Prince Regent to have his Pavilion lighted by gas, as signified by the certificate of Sir Benjamin Bloomfield to Mr. Jonathan Taylor, and to exercise the powers and privileges granted to Mr. Taylor by the Town Commissioners to lay down pipes in the streets for the purpose of lighting the Pavilion and the town. The second resolution sanctioned the formation of the Company, with a capital of £25,000, divided into 1250 shares of £20 each, to carry out the scheme; and it was decided to apply for an Act of Incorporation. A certain number of the shares were to be reserved for persons residing in Brighton who might be desirous of participating in the undertaking.

The Mr. Taylor already referred to having for a long time incurred considerable expense and loss of time in obtaining the patronage of the Prince Regent for the lighting scheme, and in procuring the grant from the Town Commissioners for laying down pipes, the meeting decided that he should be remunerated for his trouble, either by a sum of money or in shares in the Company; and the amount was left to be determined by a Committee. Mr. Taylor had also, with the view of facilitating matters, supplied, at his own cost, upwards of £1000 worth of material which he considered to be useful and necessary for the undertaking; and it was decided that this should be purchased by the Company. Moreover, as it appeared to the meeting that his views in regard to conducting the concern "by procuring gas, coke, and lime by one carbonization" promised to prove lucrative if adopted, he was considered to be a proper person to superintend and control the works at Brighton under the regulations and directions of the Committee of Management.

Another resolution dealt with the constitution of the Committee (one member of whom was to be the Chairman), who were to superintend the affairs of the Company, and prosecute the application to Parliament; and they were empowered to award to Mr. Taylor and others, in connection with the formation of the Company, the necessary remuneration. Messrs. Masterman and Co., a firm of bankers in London, were appointed Bankers and Treasurers of the Company. Mr. William Cole was selected as the Solicitor to prepare the petition to Parliament and draft the necessary Bill, and Mr. Browne as the Parliamentary Agent.

The final resolutions were to the effect that Mr. Taylor was to wait upon the Town Commissioners and the several inhabitants who might be friendly to the undertaking, to solicit their participation therein and procure their signatures to the petition to Parliament; and as, with the view of saving expense, he had offered his gratuitous services as Secretary until the Committee should appoint a proper person to fill the office, he was requested to subscribe to the resolutions and act in the capacity named.

Appended to the resolutions were the names of the parties who had agreed to take shares, and the number (generally twenty) for which they subscribed.


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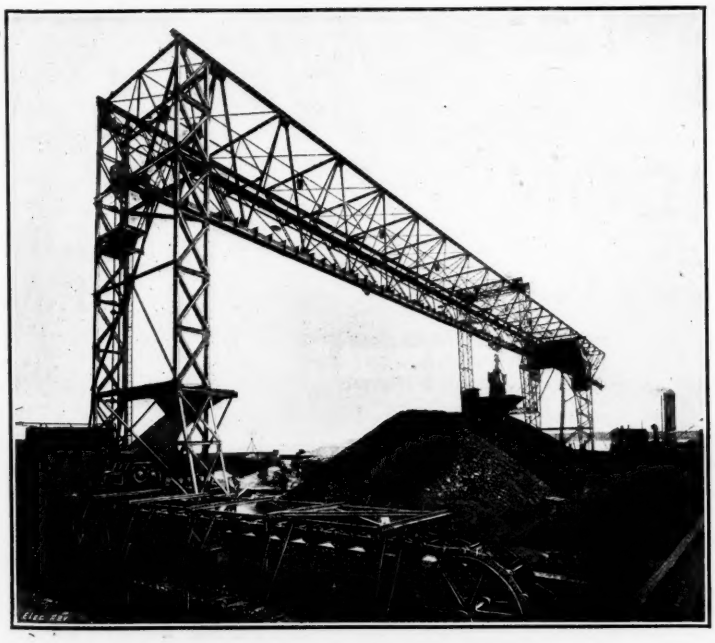

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## THE BRAZILIAN TAX ON MONAZITE SAND.

The United States Consul-General at Rio de Janeiro has furnished a report to his Government on the Brazilian tax on monazite sand, concerning which he writes as follows:—

A number of inquiries sent by American manufacturers interested in thorium products with respect to monazite sand in Brazil, and especially to the Brazilian tax upon exports of the sand, indicate some change in the business in the United States which may be effected by Brazilian conditions. Contrary to the impression which seems to exist in the United States, there is no increase in the export tax on monazite in Brazil, though the practical effect of the course of business in this country has been such as to lead to conditions amounting to an increase. The Federal authorities continue to charge about 50 per cent. on exports; or, rather, they allow the person handling the sand 50 per cent. of the sale value, taking the balance. In Bahia, the tax remains at 27 per cent. *ad valorem*, in addition to $4·85 per ton specific export tax. In Espirito Santo, the tax has been 20 per cent. *ad valorem*, *plus* £1 (or $4·86), £2, or £3 per ton specific duty, dependent upon whether the exporter, a third person, or the Government owns the ground from which the sand is taken. The State Legislative Assembly of Espirito Santo has been debating the question of an increase in the tax imposed by the State; but as yet no action has been taken.

The quality of the deposits of monazite sand now being worked in Brazil is not so good as it was formerly. It is not so rich in thorium, and is more difficult to secure. So long as the tax on sand remains at the former figure, and while the percentage of thorium is decreased, there is, in fact, an actual increase in the tax on thorium, the valuable constituent of the sand. Taking the Brazilian fields as a whole, this decrease of richness, and corresponding increase of taxation, has been considerable. Exporters of the sand say that they can do no business in the United States because the present tariff of 6 c. per pound is, at 5 per cent. of thorium, an actual tax of $1·20 a pound, and is practically prohibitive to them. There seems to be a general feeling among those concerned that some material changes in Government regulations of the business are imminent. The exports of the sand from Brazil in 1906 amounted to 4,351,600 kilos. (9,573,520 lbs.), valued at $480,843, compared with 4,437,290 kilos. (9,762,038 lbs.), valued at $485,184 in 1905.

**Crewkerne District Council and the Water-Works.**—The proposal of the Crewkerne District Council to purchase the water-works makes slow headway. At the meeting of the Council last week, Mr. E. B. Taylor, the Engineer engaged by the Council to inspect and value the Company's machinery and plant, presented his report. He said he was of opinion that the sum of £14,335 was a fair value for the undertaking, and would be just to both parties. The Council postponed consideration of the report for a fortnight, in order that the ratepayers might have an opportunity of discussing it.

## NOTES FROM SCOTLAND.

**From Our Own Correspondent.**

*Saturday.*

The Aberdeen Corporation gas accounts, of which I gave a summary last week, were approved by the Town Council on Monday, after the usual explanatory statements by Bailie Kemp, the Convener of the Gas Committee. [Mr. Kemp's remarks appear in another column of this issue of the "JOURNAL."] The statement is interesting in that it gives emphasis to the impression that much can be done, in the shaping of the policy of gas undertakings, by the judicious exercise of foresight. This was one of the outstanding characteristics of the late Mr. A. Smith, who was for many years the Manager of the undertaking; and it is being as fully exemplified in the management of his worthy successor—Mr. S. Milne. In Aberdeen, things are so conducted that before the necessity arises provision has been made for it. For that reason there never are any crises in the Aberdeen gas supply. It may be said that it is a much easier matter to conduct a gas undertaking in a city which is growing with continuous rapidity (as Aberdeen is) than in a decaying place; and so it is, because the anxieties and worries as to how to get ends to meet from year to year are not experienced. But a growing city presents a much deeper problem to the authorities in charge of a gas undertaking than does a decaying one. In the latter case, the equipment exists, in capital and works, and the only question is how to apply them to the best advantage; whereas in the former case, the future, with all its uncertainties, has to be gauged, and discretion requires a wide view to be taken of possibilities, and a liberal provision to be made for eventualities. That this is attended to in Aberdeen is well brought out by the fact that, at a time when extensions are costly, the capital expenditure during the year was only £3300, and yet, though the consumption of gas is rapidly increasing, there is no call for any augmentation in the expenditure of capital. The works and plant have been so attended to that they have borne the burden of an increased output without strain, and are capable of bearing a still greater burden. And, further, in the bearing of the increase in the immediately past years, they have enabled the Treasurer to lay up a surplus of £6385, which now, when the stress of dearer coal has come, has enabled the Council to go on for another year without raising the price of gas. This they are able to do by reason of their confidence in the elasticity of the demand for gas. With this confidence in their minds, they are content to face with equanimity an anticipated deficit, in the current year, of £1755, feeling certain that, should the coal market cease from troubling them by the end of the present year, they will be able to go on serving the community without varying their call upon the purses of the consumers. Bailie Kemp, the Convener, put the matter very sensibly indeed when he said that any increase in price should be the last resource, because of its disturbing effect on the calculations of consumers for manufacturing as well as for domestic purposes. This is an enlightened view which conveners

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would do well to take to heart, because there is no doubt that oscillations in price do check the demand for gas. But the Convener would not have been able to say what he did unless he had been in a position to offer more gas if it were required. So we come back to the reflection that the foundation of prosperity, in the case of gas undertakings, is to look well ahead in the matter of equipment, and not to wait till dire necessity requires schemes of extension to be proceeded with hastily, irrespective of cost to the undertaking, the public being meanwhile alienated by present-day inconveniences. The only individual item in Mr. Kemp's statement to which I would call attention is that in which he gives the increase in the number of cookers and heaters in use during the past two years. The increase amounts to 1128; and, though he did not say so, there is little doubt that it is due to the policy of encouraging the use of these appliances which was inaugurated about two years ago. It is also a result of the highly-successful exhibition of gas appliances which was held in the city in the spring of last year.

At a recent meeting of the Glasgow Town Council, at which the assessments for the year were fixed, Bailie Kirkpatrick, in submitting the estimates, said that the lighting establishment asked for an expenditure of fully £8000 more than last year. This was largely due to the increase of men employed, to some extent to increments in pay, and chiefly to the higher price of gas and to the additional consumption expected because of better lighting in many parts of the city.

The Elgin gasholder question comes to the front again. Agreeably to the promise made by Provost Christie to the objectors at the conference with them, an account of which was given in the "JOURNAL" last week, the Town Council held a special meeting on Monday to consider whether a compromise in the matter could not be effected. Provost Christie said his own idea was that perhaps the best compromise they could offer was to sink the gasholder in the site at the back of the North Lodge. There would be little difficulty, he thought, in going down a matter of 10, or possibly 15 feet. The depth would depend upon the nature of the subsoil. If the gasholder were sunk 15 feet, there would be very little of it seen above the roof of North Lodge, and then only when it was fully inflated. The sinking of it would cost at least £500 more, but he was sure the Town Council would be willing to incur the expense if thereby the objections of the householders could be met. He would like to add that he thought too much had been made of the leakage of gas. He found that if they were able to reduce the leakage by 5 per cent., which would bring it down to 12 per cent. —about as small as in any town of the size of Elgin—it would mean a reduction of something like 5000 cubic feet per day. This, upon a maximum consumption of 200,000 cubic feet per day, would practically make no difference in the size of the gasholder required. The waste was not at the works, but in the distribution of the gas. He suggested that a few high poplar trees might be planted at the rear of North Lodge, which would screen the gasholder a good deal from view. By sinking the gasholder 15 feet, there would be about 45 feet of it showing above the ground, and the height of North Lodge was about 40 feet. Bailie Davie pleaded for delaying the question, in view of the startling revelations the expert was making in regard to the leakage of gas throughout the town. Between his shop door and North Street, the expert had discovered a leakage of about 500 cubic feet of gas per day. This find, with other ten similar leakages, would add 5500 cubic feet per day, or 2 million cubic feet a year, to the gas supply—an amount which, at 3s. per 1000 cubic feet, would effect a saving of £300 a year. But he was in favour of the North Lodge site, if the gasholder could be sunk as proposed. Mr. Norris Mackay said that his objection was to the site altogether, and not to the height of the holder. There was now no present urgency in the matter. The gasholder could not be put up in time for this winter. It was a large question, and should come before the ratepayers. If the ratepayers decided that it was to be at North Lodge, he would not further oppose. Bailie Gordon, the Convener of the Gas Committee, moved that, in view of the indication which had been received from the objectors that any modification of the structural erection of the holder would meet with their approval, and inasmuch as the Council could see their way to lower it, intimation be given to the agent for the objectors that the Council were prepared, as far as possible, to lower the gasholder from 10 to 15 feet. Mr. Norris Mackay moved for delay, so as to give time to look out for another site; but his amendment was not seconded. Another was proposed, that the matter be delayed till after the November elections; but the Convener's motion was carried by 13 votes to 3.

In the North Berwick Town Council the other night, Mr. Nelson, the Convener of the Gas Committee, said that instead of increasing the price of gas, seeing that coal had gone up so much, the Committee were in a position to recommend that the price remain as formerly—3s. 6½d. per 1000 cubic feet. This he thought very satisfactory, when they considered that in other places they had found it necessary to raise the price. At one time he was rather doubtful whether they would be able to do what they proposed, but he now found it possible. The Committee further hoped to have a surplus at the end of the year. The Council unanimously approved of the recommendation. They further agreed to raise the price of coke from the existing price of 8s. 4d. to 10s. per ton, the advance to come into force immediately. The price of gas was reduced from 3s. 9d. to 3s. 6½d. in October last.

In the Newport (Fife) Town Council on Monday, it was agreed to place £250 out of the profits of the Gas Department to a reserve fund recently instituted, and to continue the price of gas for the current year at 3s. 10d. per 1000 cubic feet

It is reported of the Stonehouse (Lanarkshire) Gas Company that it continues to make progress; the consumption of gas for the past month having been 112,000 cubic feet more than in the corresponding month of last year. The increase for three months has been 218,000 cubic feet. The authority from which I quote adds that it may be of interest to weavers to learn that inverted incandescent gas-mantles can be utilized for the purpose of lighting weaving-shops. The apparatus has been fitted up in the office of the Secretary, for the purpose of showing the applicability of the light.

# A LETTER WORTH READING.

TELEPHONES
—NATIONAL—
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GENERAL MANAGER

*Portsea Island Gas Fittings Company Ltd*
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*Portsmouth* 3rd August 19 07.

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Yours faithfully,
J. D. Ashworth
General Manager.

*Facsimile of letter received by Bland & Co., 63, Queen Victoria Street, London, and Manchester.*

## CURRENT SALES OF GAS PRODUCTS.

LIVERPOOL, *Sept.* 7.

**Sulphate of Ammonia.**

With the covering of August contracts, the market assumed a quiet tone; buyers being disposed to wait in respect of their September requirements. But stocks in the hands of makers being inconsiderable, there has been no pressure to sell, and values remain without material alteration. The closing quotations are £11 15s. per ton f.o.b. Hull, £11 18s. 9d. per ton f.o.b. Liverpool, and £12 per ton f.o.b. Leith. There is also less inquiry in the forward position; buyers being discouraged by the firmness of makers, who are quoting £12 2s. 6d. per ton for October-December delivery, and £12 5s. per ton for delivery over the spring months. A certain amount of speculative selling abroad is reported at substantially below these figures.

**Nitrate of Soda.**

This market remains quiet but steady at 11s. 1½d. to 11s. 4½d. per cwt. for ordinary and refined qualities, on spot.

LONDON, *Sept.* 9.

**Tar Products.**

The market for tar products is without much change. Pitch appears to be rather easier, and manufacturers are willing to accept a reasonable figure for their makes to the end of the present year. Business has been done at 26s. on the east coast to the end of the year, and 26s. 6d. to the end of June next. On the west coast, manufacturers appear to be fairly well sold, and not very anxious for business. South Wales buyers decline to entertain any further quantity for delivery during the present year, and will now only buy at reasonable figures for delivery all over 1908. The Continental buyers seem to be indisposed to purchase just at present, and there will probably not be much doing until the end of the month. Creosote is very firm, particularly fn the North, where high figures are reported to have been paid for delivery f.o.b. In the Midlands, manufacturers still ask 3d. per gallon. In London, parcels have been sold at prices varying from 2⅞d. to 2¾d., while it is reported that some quantity has been sold at 3d. Benzol, 90 per cent., is quiet. There are sellers at 8¼d. to the end of June next, on the east coast, while London makes are said to have been sold at 8d. per gallon for prompt delivery. Benzol, 50-90 per cent., and toluol are both without any demand, and no sales of importance have been made. Solvent naphtha is quiet. Business has been done at low figures in the North, while it is understood that 1s. 2½d. has just been accepted for London makes. But in most cases manufacturers ask 1s. 3d. Carbolic acid is steady. Continental consumers refuse to advance their quotations, but manufacturers report that they are getting better prices than those offered by them. Crystals are quiet; and the last French Government contract was, it is reported, let at a very low figure indeed. Anthracene is without interest.

The average values during the week were: Tar, 15s. 3d. to 19s. 6d., *ex* works. Pitch, London, 27s.; east coast, 26s.; west coast, 25s. to 26s. Benzol, 90 per cent., 8d. to 8½d., casks included; 50-90 per cent., 8¼d. to 8⅝d., casks included. Toluol, 10d. to 10½d., casks included. Crude naphtha, 4d. to 4½d., naked; solvent naphtha, 1s. 1d. to 1s. 2d., casks included; heavy naphtha, 1s. 0½d. to 1s. 1d., casks included. Creosote, London, 2⅝d. to 2¾d., naked; North, 2⅜d. to 2⅝d., naked. Heavy oils, 3⅛d. to 3¼d., naked. Carbolic acid, 60 per cent., 1s. 8¼d., casks included. Naphthalene, £6 10s. to £12 10s., packages included; salts, 35s. to 40s., packages included. Anthracene, "A," 1½d. to 1¾d., casks included.

**Sulphate of Ammonia.**

This article is still fairly steady. The principal London Gas Companies' nominal price is £12 2s. 6d. to £12 5s.; and ordinary makes can be taken at £11 11s. 3d. to £11 12s. 6d. on Beckton terms. Leith remains at £12 to £12 2s. 6d. Hull may be taken at £11 15s. to £11 16s. 3d.; and Liverpool at £11 16s. 3d. to £11 17s. 6d.

## COAL TRADE REPORTS.

**Lancashire Coal Trade.**

A rise of 1s. 8d. per ton for house coal, and 10d. per ton for steam fuel, has taken place without much demur. Steam users are clamouring for coal as eagerly as ever. During the last week in August, there were a dozen times as many orders for coal at the Lancashire collieries as there were in the corresponding week of 1906. The general demand during the summer was so much larger than usual that no stocks have been accumulated. All coal brought to the surface has been cleared off as fast as it was raised. Steam coal contracts are 3s. 6d. per ton higher than last year. Coal for shipping is in full request. There is not much doing in gas coal and cannel at present; but as winter approaches, all new contracts will have to be made at an increased cost. The average quotations at the pits are: Best house coal 15s. to 16s. 6d. per ton, seconds 14s. to 15s., common 12s. to 13s. 6d., burgy 10s. 6d. to 11s. 4d., best slack 9s. 6d. to 10s. 4d., medium 8s. 6d. to 9s., lower qualities 7s. 9d. to 8s. 4d., coal for shipping 13s. 6d. to 14s. 6d., furnace coke 17s. to 24s.

**Northern Coal Trade.**

Though there has been some hindering of shipments of coal owing to the lack of ready steamers, this difficulty is lessened, and heavy exports are now again being made. There is also a growing home consumption. In steam coals, the shipments to the Baltic are being pressed forward, and thus prices are very firm. Best Northumbrian steams are now quoted at about 16s. 6d. per ton f.o.b., second-class steams are steady at about 15s. 9d., and steam smalls are from about 10s. to 10s. 6d. There is some complaint as to the limited output of the collieries; but the production is often interfered with at this season by local holidays. In the gas coal trade, the local demand is increasing, and the exports are still very heavy. Durham gas coal varies from about 14s. to 15s. 6d. per ton f.o.b., according to quality, with a higher

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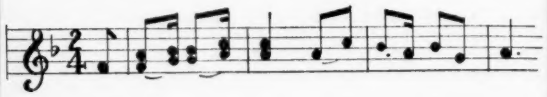

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quotation for one or two special classes. As to contracts, there have been further sales of best gas coals for forward delivery—one of about 60,000 tons, at a price that is expected to leave about 13s. 9d. per ton f.o.b.; and some smaller quantities have been sold at 14s. per ton. For early delivery, there is very little coal free for sale, so that high prices are quoted for any that is still available. Coke is firm; and though the output of gas coke is increasing, it is well taken, with the prices steady at about 20s. per ton f.o.b.

**Scotch Coal Trade.**

Trade continues to be very brisk, with retail prices going up. In wholesale circles there is a panic among buyers, which is playing into the hands of the coalowners. For the next few weeks, perhaps months, the outlook is not very promising for those who are not under contract, as the immediate future is likely to see the tightest squeeze of the present boom. So far, there have been no complaints of short deliveries under contract. That is a matter, however, which owners of gas-works will do well to prepare for. The prices quoted are: Ell 15s. to 16s. 6d. per ton f.o.b. Glasgow, splint 15s. to 15s. 6d., steam 14s. to 14s. 3d. The shipments for the week amounted to 324,977 tons—a decrease of 4546 tons upon the preceding week, but an increase of 38,299 tons upon the corresponding week of last year. For the year to date, the total shipments have been 9,741,458 tons—an increase of 608,158 tons upon the corresponding period of 1906.

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**Manchester Gas-Workers' Wages.**—Some weeks ago, a section of the employees of the Manchester Corporation Gas Department applied for an increase of wages and an extension of holidays; and when the matter came before the Gas Committee for consideration last Friday, Alderman Gibson, the Chairman, stated that on careful inquiry being made respecting the conditions of labour in other large gas-works, it was found that the men employed in Manchester were treated more favourably than in some other places, and quite as favourably as in any other gas-works, with perhaps one exception. Under these circumstances, the Committee regretfully decided that they could not comply with the men's request.

**Lighting Schemes for Whitehead.**—The Whitehead Ratepayers' Association lately called a meeting to consider various schemes of public lighting which had been drawn up by a Committee to whom the work had been delegated. Estimates were submitted of the cost of four systems—acetylene, oil gas, electricity, and petrolite. One estimate for acetylene was £1326, another £1441, and a third £1650. For oil gas, the total cost was put at £2640. One estimate for electric lighting was £2200; while another was £2163 for the complete work. An expenditure of £494 would be necessary to light forty lamps with vaporized petrol; the upkeep being estimated at £75 per annum. After some discussion it was decided that the best thanks of the ratepayers be tendered to the Committee for their labours during the past year on the question of public lighting, and that it be referred back to them for further consideration.

**Overcome by Gas at Paisley.**—On Saturday week, a family residing at Walker Street, Paisley, had a narrow escape from being suffocated by gas. In the morning, one of the tenants on the second flat of the tenement became aware of a strong smell of gas. He examined the fittings, but found nothing wrong; and he then suspected that the gas was coming from the house on the ground floor occupied by John Gray, his wife, and two daughters. Going downstairs, he knocked several times at Gray's door, but received no answer. Summoning assistance, he effected an entrance by the back window, when Gray, his wife, and daughters were discovered in an unconscious condition in bed; while there was a strong smell of gas in the house. Medical aid was summoned, and under treatment the two daughters soon recovered. The father and mother, however, were in a more serious condition. The cause of the escape of gas had not been discovered by Saturday evening.

**Increase of Price at Ossett.**—At the last meeting of the Ossett Town Council, the Gas Committee's minutes contained a recommendation that the price of gas should be increased 3d. per 1000 cubic feet, as from the reading of the meters next month. Mr. Robinson, in moving the confirmation of the minutes, explained that necessity had compelled the Committee to advance the price of gas. He said it was purely a question of coal supply; and if any vengeance was justified, it was against those who had the coal in the hollow of their hand, so to speak. "We are the victims of a combination," he added, "who are determined to have their full pound of flesh. We are the victims of a combine within a combine." Their coal this year would cost them £1200 more for the same quantity than it did last year; the net increase being £700. As they had not a reserve fund, they had to find another way of meeting it; and the only course was to increase the price of gas. The users of prepayment meters would be left alone. A proposal to abolish meter-rents concurrently with the increase in price was suggested; but it was not supported, and the minutes were passed.

New **Joint-Stock Companies.**—The "K and A" Water-Gas Company, Limited, has been formed with a capital of £20,000, in £1 shares, to "acquire a certain invention relating to the manufacture of water gas and semi-water gas and apparatus therefor, pursuant to an agreement with J. J. L. Van Ryn." There will be no initial public issue. The first Directors (not less than two nor more than five) are Messrs. H. A. Bartlett and J. J. L. Van Ryn, who have power to appoint another. The offices of the Company are at No. 39, Victoria Street, S.W. The Illuminating Engineering Publishing Company, Limited, has been formed with a capital of £2000, in £1 shares, to establish, print, and publish a magazine, newspaper, or newspapers, in London or elsewhere, for the purpose of furthering the interests of illuminating engineering, &c. There will be no initial public issue. One of the first Directors is Mr. Leon Gaster. The Rawcliffe (Yorks.) and District Gas and Coke Company, Limited, has been registered with a capital of £10,000, in £5 shares (1000 shares being 6½ per cent. preference), to adopt an agreement between the Gas and Water-Works Supplies and Construction Company, Limited, and the Gowerton and District Gas Company, Limited, and to carry on the business of gas manufacturers, &c.


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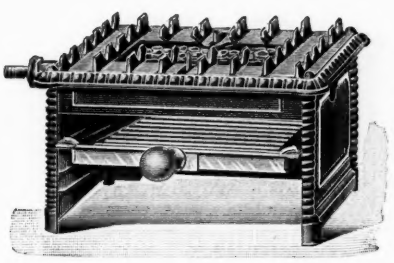

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**A. G. CLOAKE,**

54, HOLBORN VIADUCT, LONDON, E.C.

**Coal Prices and Gas Profits at Batley.**—At a meeting of the Batley Town Council, Mr. Kirby asked what effect the increased price of coal would have upon the finances of the town, and whether the Gas Committee would take any steps to stop the encroachment upon the profits of the gas-works. Mr. Childe replied that fully 2s. per ton increase was being paid on a contract of 18,000 tons; and this would mean £1800 less profit on the gas undertaking.

**Serious Explosion at the Nice Gas-Works.**—According to a telegram from the Nice correspondent of the "Star," a serious explosion occurred at the St. Roch Gas-Works last Friday. It appears that a valve on the inlet-pipe to the gasholder gave way, and the gas streamed back and became ignited by the furnace fires. The buildings were much damaged and several workmen were injured. A few particulars of the Nice Gas-Works, with illustrations, were given in the "JOURNAL" for the 11th of June last (p. 724).

**Liverpool City Council and the Gas Supply.**—By 21 votes to 19, the Liverpool City Council have rejected a motion proposed by Mr. Boote, in the following terms: "That a Special Committee be appointed with power to take evidence and make such inquiry as may be necessary, with the view to enable the Corporation to acquire their own gas supply for the requirements of the city generally; and that the Committee submit a report thereon to the Council at an early date." Mr. Walker, who seconded, remarked that an inquiry into such an important matter could do no possible harm.

**Lighting of Moreton Hampstead.**—It is proposed by the Devon Gas Association to undertake the lighting of Moreton Hampstead by gas; and an agreement has been practically concluded with the parochial authority respecting the terms on which this shall be done. In the original draft agreement, there was a stipulation that the lamps should not be lighted for three days before and three days after full moon. The Parochial Committee were, however, of opinion that the lighting on these nights should be discretionary; and they inserted a clause to this effect, with the condition that payment for any additional lighting shall be *pro ratâ* with the ordinary charge.

**Teignmouth Water Supply.**—Progress is being made with the work of laying the main to supply Teignmouth with water from the new reservoir which is being constructed on Dartmoor by the Paignton District Council. A difficult section of the scheme is the crossing of the River Teign; but this work is well in hand, and it was reported at a meeting of the Council last week that the deepest part of the river had been crossed, and that by the end of the month this part of the contract will be completed. It is anticipated that the new supply will be available before next summer. Meantime, the water-rate has been increased from 1s. 4d. to 1s. 9d. for the half year; and it is anticipated that it will be further advanced. This, however, will be a small trouble compared with that which Teignmouth has experienced over its water supply in dry seasons.

**A Retrospective Increase at Wigton.**—The Wigton Gas Company having, like so many others, lately increased the price of gas, the Urban District Council have decided to ask for an abatement. Mr. Twentyman, who moved that this course should be adopted, said that, in the first place, he did not see how the Company could make the increase retrospective. They gave notice about Aug. 29 that the increase would date from July 1. Mr. Carruthers remarked that he was quite of Mr. Twentyman's opinion; he did not see how the Company could make the increased charge retrospective. Those who had consumed gas during July and until the third week in August, had purchased it at 3s. per 1000 cubic feet, so he could not understand how the price for that period could be raised to 3s. 4d. He quite agreed that the Council, being the largest customers of the Company, really ought to have gas on a lower basis. Another member added that there was a great deal of dissatisfaction in the town about the advance.

**Projected Gas-Works Extensions at Wallasey.**—In a report to the Committee, Mr. J. H. Crowther, the Gas Engineer at Wallasey, expressed the opinion that the time had arrived when, in order to keep pace with the demand for gas, the Council should consider the advisability of proceeding with extensions at the works. Referring to the matter at the monthly meeting of the Urban District Council, the Chairman of the Gas Committee (Mr. Eastwood) said the requirements of the district in the matter of the supply of gas were growing to such an extent that there was danger of the limit of the productive capacity of the works being unequal to the demand. It was estimated that the proposed addition would cost £90,000; but there was no reason why they should spend this money till the demand required it. The Committee, however, put forward the matter now so that they might be able to get the Provisional Order this year. He pointed out to the Council that the gas undertaking since its inception had handed over £80,000 in relief of the rates, though at the present time the ratepayers were supplied with gas at 6d. per 1000 cubic feet less than either Liverpool or Birkenhead.

**The Public Lighting of Falmouth.**—The question of the terms on which the contract for the public lighting of Falmouth should be renewed was discussed at a meeting of the Town Council on Thursday. The Gas Company offered to light, extinguish, repair, and clean the lamps for £250 per annum; the gas to be charged for by meter at the current rate. The General Purposes Committee recommended that the Company be informed that the offer would be accepted for one year. Mr. Chard, in moving that this recommendation be carried out, said the gas lighting had been done far better the past year or two than before. Mr. Cox proposed that the contract should be for three years; contending that on the terms offered by the Company for this period the Council would save money. Several members supported this view. Mr. Mead opposed an extension of the term or the acceptance of conditions which would bind the Council to a definite arrangement for lighting for a period of years at a definite price. If they were supplied by meter, they could have any hours of lighting they pleased. The Town Clerk, in answer to a question, said the Gas Company were prepared to enter into a contract for the lighting of the lamps on the same terms as before, provided the Corporation replaced all the old lamps by suitable incandescent lamps, and were also willing to take the contract for five years. It was decided that the General Purposes Committee should further consider the matter, and present another report.

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***SHOW-ROOMS:***—LONDON (City)—15, Upper Thames Street, E.C.; (West End)—23, Princes Street, Cavendish Square, W.; LIVERPOOL—22-30, Red Cross Street; GLASGOW—125, Buchanan Street; MANCHESTER—24, Brazennose Street; BRISTOL—10, Victoria Street; NEWCASTLE-ON-TYNE—13, Prudhoe Street; BIRMINGHAM—218, 220, 222, Corporation Street; DUBLIN—44, Grafton Street.

CARRON COMPANY · ESTO PERPETUA · FOUNDED 1759 · INCORPORATED BY ROYAL CHARTER 1773 ·

A sum of £16,620 is to be borrowed for the purpose of carrying out extensions at the Middleton Gas-Works. The greater part of the money is to be spent on inclined retorts.

The decision of the Cuckfield (Mid-Sussex) Rural District Council to lower their well at Balcombe, with a view to increasing the water supply, has proved a wise one. The borehole has been lowered to a total depth of 390 feet, and a very large increase in the yield of water has resulted—more than sufficient, it is stated, to meet the needs of the Mid-Sussex area.

The 32nd annual report of the Public Works Loan Commissioners, just issued, shows that during the financial year 1906-7 the Commissioners made 906 advances for sums amounting altogether to £2,123,496. These figures are decreases of 124 in the number of advances, and of £142,809 in amount, as compared with the preceding twelve months. Of the above total of £2,123,496, £1,995,845 was advanced on the security of local rates, and £127,651 on the security of property. The average rate of interest receivable was £3 13s. 7d. per cent., against £3 13s. in 1905-6, £3 9s. 2d. in 1904-5, £3 5s. 9d. in 1903-4, £3 5s. 1d. in 1902-3, and £3 3s. 7d. in 1901-2.

The Local Government Board have sanctioned the borrowing by the Nelson Town Council of £22,000 for gas-works purposes, and £8700 for cookers and meters—the period of repayment to be ten years. The Board have also authorized the borrowing of £7100 (£5700 for mains and £1400 for a new driving-main); to be repaid in thirty years.

Last Wednesday evening, the members of the Lincoln Municipal Officers' Association, with a few friends, visited the Bracebridge Gas-Works of that town, at the invitation of Mr. John Carter, the Gas Manager to the Corporation. On arrival, the company, which numbered about eighty, sat down to a meat tea in a marquee which had been erected in the grounds in front of the works; and afterwards the works were inspected. Prior to the latter event, however, the Chief Constable (Mr. J. T. Coleman), as President of the Association, proposed a vote of thanks to Mr. Carter for his kindness in inviting them to the works and entertaining them to tea. The vote of thanks was accorded with acclamation; and, in replying, Mr. Carter gave a very lucid description of what was to be seen at the works, and detailed the various stages in the manufacture of gas from the raw coal. The party were conducted round by Mr. Carter and Mr. Mainwaring, the Manager of the Bracebridge works.

## LEAFLETS FOR DISTRIBUTION.

"ILLUMINATING TRUTHS FOR HOUSEHOLDERS."

No. 1.—"The Sanitary Aspects of Gas and Electric Lighting."
No. 2.—"The Cleanliness of Illuminants: The Eyesight."
No. 3.—"Fire Risks."
No. 4.—"The Relative Cost of Gas and Electricity, and Matters affecting it."
No. 5.—"On Reliability, with Instances of Misplaced Confidence."
No. 6.—"On Shop Lighting, with Special Reference to the Flame Arc Lamp."

*This series of Leaflets will be useful, not only for distribution among Householders generally, but for circulation among Shareholders to fortify them with arguments in defence of the commodity in which they have invested capital. Copies of each Leaflet should also be kept in every Gas Undertaking's Show-Rooms.*
*Prices for Quantities on Application to* WALTER KING, 11, BOLT COURT, FLEET STREET, E.C.

## WANTED, FOR SALE, CONTRACT, &c., ADVERTISEMENTS IN THIS WEEK'S "JOURNAL."

### Situations Vacant.

ENGINEER (New Zealand). No. 4825. Applications by Sept. 17.
DRAUGHTSMAN. No. 4835.
TRAVELLER. No. 4833.
SHOW-ROOM ATTENDANT (Man and Wife). Heywood Gas-Works. Applications by Sept. 17.

### Gas Literature Wanted.

L. P. LOWE, 1214, Polk Street, San Francisco.

### Situations Wanted.

ANALYTICAL CHEMIST. No. 4837.
ENGAGEMENT IN GAS OR WATER OFFICE. J. F. Watson, Soham, Cambs.
GAS-FITTER, METER READER, &c. S. Wait, Swindon.
REPRESENTATIVE (GAS AND WATER). No. 4813.
WORKING MANAGER. J. Smith, Buckingham.
SITUATION IN GAS-WORKS. No. 4836.

### Plant, &c., for Sale.

CONDENSER TUBES. Romford Gas Company.
TWO CORNISH BOILERS. Malvern Urban District Council.

### Plant, &c., Wanted.

ROTARY SCRUBBER. No. 4834.
TELESCOPIC GASHOLDER. Midland Coal, Coke, and Iron Company, Limited, Newcastle, Staffs.

### Patents for Sale.

RELATING TO GAS-BURNERS.

### Company Meeting.

BRITISH GASLIGHT COMPANY, LIMITED. Offices. Sept. 25. 12 o'clock.

### Stocks and Shares.

GREAT YARMOUTH GAS COMPANY. Sept. 26.

### TENDERS FOR

#### Coke.

WANDSWORTH AND PUTNEY GAS COMPANY. Tenders by Sept. 23.

#### Lead and Compo. Pipe, &c.

RHONDDA URBAN DISTRICT COUNCIL. Tenders by Sept. 19.

#### Sulphuric Acid.

LEICESTER GAS DEPARTMENT. Tenders by Sept. 21.

#### Tar and Liquor.

BRADFORD GAS DEPARTMENT. Tenders by Sept. 19.
COLWYN BAY AND COLWYN GAS DEPARTMENT. Tenders by Sept. 24.
ISLE OF THANET GASLIGHT COMPANY. Tenders by Sept. 19.
MARKET HARBOROUGH GAS DEPARTMENT. Tenders by Sept. 21.

## GAS COMPANIES' STOCK AND SHARE LIST.

**Referred to on p. 682.**

| Issue. | Share. | When Div. | Dividend or Dividend & Bonus. | NAME. | Closing Prices. | Rise or Fall in Wk. | Yield upon Investment. |
|---|---|---|---|---|---|---|---|
| £ | | | p.c. | | | | £ s. d. |
| 500,000 | 10 | Apl. 11 | 10½ | Alliance & Dublin 10 p.c. | 20—21 | .. | 5 0 0 |
| 268,324 | 10 | ,, | 7½ | Do. 7 p.c. | 13¾—14½ | .. | 5 3 5 |
| 200,000 | 5 | May 15 | 7 | Bombay, Ltd. | 6¾—7 | .. | 5 0 0 |
| 40,000 | 5 | ,, | 7 | Do. New, £4 paid | 4⅝—5¼ | .. | 5 6 8 |
| 50,000 | 10 | Aug. 29 | 14 | Bourne- mouth Gas and Water 10 p.c. | 27—28* | .. | 5 0 0 |
| 51,810 | 10 | ,, | 7 | B 7 p.c. | 16½—16¾* | .. | 4 3 7 |
| 53,200 | 10 | ,, | 6 | Pref. 6 p.c. | 14⅛—15⅛* | .. | 3 17 5 |
| 380,000 | Stk. | Aug. 15 | 12½ | Brentford Consolidated | 245—250 | .. | 5 0 0 |
| 300,000 | ,, | ,, | 9⅜ | Do. New | 185—190 | .. | 5 0 0 |
| 50,000 | ,, | ,, | 5 | Do. 5 p.c. Pref. | 115—120 | .. | 4 3 4 |
| 206,250 | ,, | June 13 | 4 | Do. 4 p.c. Deb. | 100—103 | .. | 3 17 8 |
| 220,000 | Stk. | Mch. 14 | 11½ | Brighton & Hove Orig. | 220—225 | .. | 5 0 0 |
| 246,320 | ,, | ,, | 8½ | Do. A. Ord. Stk. | 160—165 | .. | 5 0 0 |
| 460,000 | 20 | Apl. 11 | 10 | British | 41½—42½ | .. | 4 14 1 |
| 104,000 | Stk. | Aug. 15 | 6 | Bromley, Ord. 5 p.c. | 116—119 | .. | 5 0 10 |
| 165,700 | ,, | ,, | 4½ | Do. do. 3½ p.c. | 87—90 | .. | 5 0 0 |
| 500,000 | 10 | May 15 | 7 | Buenos Ayres (New) Ltd. | 10¾—11¾ | .. | 6 4 5 |
| 250,000 | Stk. | June 27 | 4 | Do. 4 p.c. Deb. | 93—95 | .. | 4 4 3 |
| 150,000 | 20 | July 12 | 8½ | Cagliari, Ltd. | 26½—27½ | +½ | 6 0 0 |
| 100,000 | 10 | June 13 | 10 | Cape Town & Dis., Ltd. | 11—13 | .. | 7 13 10 |
| 100,000 | 10 | Apl. 26 | 4½ | Do. 4½ p.c Pref. | 8—9 | .. | 5 0 0 |
| 50,000 | 50 | May 2 | 6 | Do. 6 p.c. 1st Mort. | 50—52 | .. | 5 15 5 |
| 50,000 | Stk. | June 27 | 4½ | Do. 4½ p.c. Deb. Stk. | 94—96 | .. | 4 13 9 |
| 157,150 | Stk. | Aug. 15 | 5 | Chester 5 p.c. Ord. | 106½—108½ | .. | 4 12 2 |
| 1,443,280 | Stk. | ,, 29 | 5⅛ | Commercial 4 p.c Stk. | 101—106* | .. | 4 18 1 |
| 560,000 | ,, | ,, | 5 | Do. 3½ p.c. do. | 98—103* | .. | 4 17 1 |
| 475,000 | ,, | June 13 | 3 | Do. 3 p.c. Deb. Stk. | 81—83 | .. | 3 12 3 |
| 800,000 | Stk. | ,, | 6½ | Continental Union, Ltd. | 112—117 | .. | 5 11 1 |
| 200,000 | ,, | ,, | 7 | Do. 7 p.c. Pref. | 136—141 | .. | 4 19 3 |
| 460,170 | Stk. | — | 5⅛ | Derby Con. Stk. | 123—125 | .. | 4 8 0 |
| 55,000 | ,, | — | 4 | Do. Deb. Stk. | 102—104 | .. | 3 16 11 |
| 486,090 | 10 | July 31 | 12 | European, Ltd. | 22½—23½ | .. | 5 2 2 |
| 354,060 | 10 | ,, | 12 | Do. £7 10s. paid | 17½—18½ | .. | 4 17 4 |
| 15,318,590 | Stk. | Aug. 15 | 4 1/16 | Gas- light and Coke 4 p.c. Ord. | 93—95 | .. | 4 12 7 |
| 2,600,000 | ,, | ,, | 3⅜ | 3½ p.c. max. | 86—88 | .. | 3 19 7 |
| 3,799,735 | ,, | ,, | 4 | 4 p.c. Con. Pref. | 103—106 | +1 | 3 15 6 |
| 4,193,975 | ,, | June 13 | 3 | 3 p.c. Con. Deb. | 81—83 | .. | 3 12 3 |
| 258,740 | Stk. | Mch. 14 | 5 | Hastings & St. L. 3½ p.c. | 95—100 | .. | 5 0 0 |
| 82,500 | ,, | ,, | 6½ | Do. do. 5 p.c. | 116—119 | .. | 5 9 3 |
| 70,000 | 10 | Apl. 26 | 11 | Hongkong & China, Ltd. | 15—20 | .. | 5 10 0 |
| 1,940,000 | Stk. | May 15 | 8 | Imperial Continental | 174—176 | .. | 4 10 11 |
| 473,600 | Stk. | Aug. 15 | 3½ | Do. 3½ p.c. Deb. Red. | 91—93 | .. | 3 15 3 |
| 195,242 | Stk. | Aug. 29 | 6 | Lea Bridge Ord. 5 p.c. | 110—120* | .. | 5 0 0 |
| 306,083 | ,, | June 27 | 4 | L'rpool Unit'd Deb. Stk. | 108—110 | .. | 3 12 9 |

| Issue. | Share. | When Div. | Dividend or Dividend & Bonus. | NAME. | Closing Prices. | Rise or Fall in Wk. | Yield upon Investment. |
|---|---|---|---|---|---|---|---|
| £ | | | p.c. | | | | £ s. d. |
| 561,000 | Stk. | Aug. 29 | 10 | Liverpool United A | 217—219* | .. | 4 11 4 |
| 718,100 | ,, | ,, | 7 | Do. B | 160½—161½* | .. | 4 6 8 |
| 152,736 | Stk. | Feb. 14 | 7⅞ | Maidstone 5 p.c. | 142—147 | .. | 5 3 8 |
| 75,000 | 5 | June 27 | 5 | Malta & Medn., Ltd. | 4—4½ | .. | 5 11 1 |
| 560,000 | 100 | Apl. 2 | 5 | Met. of 5 p.c. Deb. | 100—102 | .. | 4 18 0 |
| 250,000 | 100 | ,, | 4½ | Melbourne 4½ p.c. Deb. | 100—102 | .. | 4 8 3 |
| 541,920 | 20 | May 30 | 3½ | Monte Video, Ltd. | 10½—11½ | .. | 6 1 9 |
| 1,775,892 | Stk. | Aug. 15 | 4⅝ | Newc'tle & G'tesh'd Con. | 107—108 | .. | 4 5 7 |
| 406,025 | Stk. | June 27 | 3½ | Do. 3½ p.c. Deb. | 90—91 | .. | 3 16 11 |
| 15,000 | 10 | Aug. 29 | 10 | North Middlesex 10 p.c. | 19—20* | .. | 5 0 0 |
| 55,940 | 10 | ,, | 7 | Do. 7 p.c. | 12½—13½* | .. | 5 3 8 |
| 300,000 | Stk. | Apl. 26 | 8 | Oriental, Ltd. | 140—145 | .. | 5 10 4 |
| 60,000 | 5 | Mch. 27 | 7 | Ottoman, Ltd. | 6—6½ | .. | 5 7 8 |
| 398,490 | 5 | May 15 | 7 | Primitiva Ord. | 6⅞—7⅛ | .. | 4 16 7 |
| 796,980 | 5 | July 31 | 5 | Do. 5 p.c. Pref. | 4⅞—5⅛ | .. | 4 17 7 |
| 488,900 | 100 | June 1 | 4 | Do. 4 p.c. Deb. | 94—96 | .. | 4 3 4 |
| 1,000,000 | 10 | Apl. 26 | 8 | River Plate Ord. | 13—13½ | .. | 5 18 6 |
| 312,650 | Stk. | June 27 | 4 | Do. 4 p.c. Deb. | 93—95 | .. | 4 4 3 |
| 250,000 | 10 | Mch. 27 | 8 | San Paulo, Ltd. | 13—13½ | .. | 5 18 6 |
| 125,000 | 50 | July 1 | 5 | Do. 5 p.c. Deb. | 48—50 | .. | 5 0 0 |
| 135,000 | Stk. | Mch. 14 | 10 | Sheffield A | 246—248 | .. | 4 0 8 |
| 209,984 | ,, | ,, | 10 | Do. B | 246—248 | .. | 4 0 8 |
| 523,500 | ,, | ,, | 10 | Do. C | 246—248 | .. | 4 0 8 |
| 70,000 | 10 | June 13 | 10 | South African | 15—16 | .. | 6 5 0 |
| 6,429,895 | Stk. | Aug. 15 | 5⅛ | South Met., 4 p.c. Ord. | 119—121 | +½ | 4 10 11 |
| 1,895,445 | ,, | July 12 | 3 | Do. 3 p.c. Deb. | 81—83 | .. | 3 12 3 |
| 201,720 | Stk | Mch. 14 | 8 | South Shields Con. Stk. | 159—161 | .. | 4 19 5 |
| 605,000 | Stk. | Aug. 15 | 5⅛ | S'th Suburb'n Ord. 5 p.c. | 115—118 | .. | 4 13 3 |
| 60,000 | ,, | ,, | 5 | Do. 5 p.c. Pref. | 117—120 | .. | 4 3 4 |
| 117,058 | ,, | July 12 | 5 | Do. 5 p.c. Deb. Stk. | 120—125 | .. | 4 0 0 |
| 502,310 | Stk. | May 15 | 5 | Southampton Ord. | 105—110 | .. | 4 10 11 |
| 120,000 | Stk. | Aug. 15 | 6⅜ | Tottenham A 5 p.c. | 120—123 | .. | 5 9 9 |
| 398,940 | ,, | ,, | 5⅛ | and B 3½ p.c. | 100—103 | .. | 5 1 11 |
| 149,470 | ,, | June 27 | 4 | Edmonton 4 p.c. Deb. | 99—101 | .. | 3 19 3 |
| 182,380 | 10 | June 13 | 8 | Tuscan, Ltd. | 10¼—10¾ | .. | 7 8 10 |
| 149,900 | 10 | July 1 | 5 | Do. 5 p.c. Deb. Red. | 100—102 | .. | 4 18 0 |
| 193,742 | Stk. | Aug. 29 | 5 | Tynemouth 5 p.c. max. | 107—109* | .. | 4 11 9 |
| 30,000 | Stk. | Feb. 14 | 8 | Wands- worth A 5 p.c. | — | .. | — |
| 255,636 | ,, | Aug. 15 | 6½ | B 3½ p.c. and C 3½ p.c. | 128—133 | .. | 4 17 9 |
| 75,000 | ,, | ,, | 5⅜ | | — | .. | — |
| 80,075 | ,, | June 27 | 3 | Putney 3 p.c. Deb. Stk. | 77—80 | .. | 3 15 0 |
| 845,872 | ,, | Aug. 15 | 5⅜ | West Ham 5 p.c. Ord. | 101—104 | .. | 4 18 6 |
| 185,000 | ,, | ,, | 5 | Do. 5 p.c. Pref. | 118—120 | .. | 4 3 4 |
| 228,300 | ,, | June 27 | 4 | Do. 4 p.c. Deb. Stk. | 100—103 | .. | 3 17 8 |

Prices marked * are "Ex div."

The Neath Rural District Council have accepted the tender of Messrs. Morrison and Mason, of Glasgow, at £88,932, for constructing the dam for the Ystradfellte Water-Works.

The Glamorgan County Council have received numerous claims for damages for accidents upon the Mumbles road, which had been treated with tar to prevent the dust nuisance. Several horses had slipped on the road, and people had been pitched out of vehicles.

The new Company formed with a capital of 30 million francs for carrying on the supply of gas in Paris, the title of which is "La Société du Gaz de Paris," entered into possession on the 1st inst., and are conducting the business at the offices of the old Company (now in process of liquidation), No. 6, Rue Condorcet.

The Brighton Corporation have been informed by the Water Committee that from the profit balance of £6388, the sum of £2719 had been carried to the contingent fund; allowing £3669 to be carried to next year's account. A suggestion that the whole should be applied to the relief of the rates was not entertained.

In a statement of the liabilities and assets of the borough of Bolton on the 31st of March last, lately issued by the Treasurer (Mr. George Swainson), the gas and water undertakings, which are put down as having cost £740,665 and £993,903 respectively, are entered among the remunerative and realizable works, the surplus on which is £696,372. The unremunerative but realizable assets amounted to £39,970, and the surplus revenue to £33,666; making a total of £770,008. Deducting the unremunerative and unrealizable capital outlay, £484,373, there is a realizable surplus of £285,635.

The Monte Video Water-Works Company have just declared an interim dividend at the rate of 6 per cent. per annum for the half year ended June 30.

At the recent half-yearly meeting of the Sevenoaks Water Company, at which dividends at the rates of 10 and 7 per cent. per annum on the consolidated stock and ordinary shares respectively were declared, the Directors were authorized to apply for a Provisional Order to increase the capital by £30,000.

At the monthly meeting of the Belfast County Borough Council on Monday last week, Mr. J. A. Doran, in moving the adoption of the minutes of the Gas Committee, said it was very gratifying to state that in August they had had an increase of 7,279,000 cubic feet of gas; and everything seemed to be going on very satisfactorily.

Probably the most popular feature of the second Annual Carnival of the Barking Philanthropic Society, which took place on the 29th ult., was a balloon ascent by Mr. Percival Spencer. The task of filling the balloon, which was of 45,000 cubic feet capacity, was entrusted to the Barking Gas Company, who spared no effort to promote the success of the trip. The gas was pumped through a 6-inch pipe, connected with the trunk main; a start being made at half-past ten in the morning. An excellent pressure was obtained, and the balloon was half filled in 40 minutes. The gas was then turned off until two o'clock, when the process of filling was completed. The arrangements were carried out under the personal direction of Mr. W. B. Reidie, the Manager of the gas-works, and Mr. W. C. Dean, the outdoor representative of the Company.

## NOTICES TO CORRESPONDENTS, ADVERTISERS, AND SUBSCRIBERS.

*No notice can be taken of anonymous communications. Whatever is intended for insertion in the "JOURNAL" must be authenticated by the name and address of the writer; not necessarily for publication, but as a proof of good faith.*

**COPY FOR ADVERTISEMENTS for the "JOURNAL" should be received at the Office NOT LATER than TWELVE O'CLOCK NOON ON MONDAY, to ensure insertion in the following day's issue.**

**Orders for Alterations in, or stoppages of, PERMANENT ADVERTISEMENTS should be received by the FIRST POST on SATURDAY.**

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LARGEST SALE OF ANY OXIDE,

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PALMERSTON HOUSE,
OLD BROAD STREET, LONDON, E.C.

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**"VOLCANIC" FIRE CEMENT.**
Resists 4500° Fahr. Best for GAS-WORKS.
ANDREW STEPHENSON, 182, Palmerston House, Old Broad Street, London, E.C. "Volcanism, London."

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**MEADE-KING, ROBINSON, & CO.** Represent the Strongest Independent Refineries in America; also Petroleum Spirit for Gas Enrichment. 18, EXCHANGE STREET, MANCHESTER, and 11, OLD HALL STREET, LIVERPOOL.

**DELLWIK-FLEISCHER WATER GAS.**

BLUE WATER GAS, CARBURETTED WATER GAS, SELF-CARBURETTING.
**FOR list of towns in which Plant has** been Installed, see advertisement in the "JOURNAL" for Aug. 27 last, p. 600.
The DELLWIK-FLEISCHER WATER GAS SYNDICATE, Belgravia Chambers, 72, Victoria Street, Westminster, LONDON, S.W. Telegraphic Address "Dellwik, London."

**AMMONIACAL Liquor wanted.**
BROTHERTON AND CO., LTD., Ammonia Distillers. Works: BIRMINGHAM, GLASGOW, LEEDS, LIVERPOOL, WAKEFIELD, AND SUNDERLAND.

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REPAIRS RECEIVE PROMPT ATTENTION.
Telephones: 254 Oldham, and 2412 HOP, London.
Telegrams:—
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AND
**CARBURINE FOR GAS ENRICHING.**
ALSO
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For Prices, &c., apply to
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7, BISHOPSGATE STREET WITHOUT,
LONDON, E.C.
Telegraphic Address: "Carburine, London."

**HYDRATED OXIDE OF IRON.**
**PREPARED from Pure Iron.**
Twice as Rich as Bog Ore.
Gives no Back Pressure.
The Cheapest in the Market,
Can be Exchanged for Spent Oxide.
READ HOLLIDAY AND SONS, LTD., HUDDERSFIELD.

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**JOHN E. WILLIAMS AND CO.,**
LOWER MOSS LANE,
MANCHESTER, S.W.
Telegrams: "ENAMEL." National Telephone 1759.

**GAS TAR wanted.**
BROTHERTON AND CO., LTD., Tar Distillers. Works: BIRMINGHAM, GLASGOW, LEEDS, LIVERPOOL, WAKEFIELD, AND SUNDERLAND.

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